AIR QUALITY STUDIES IN THE SAN JUAN BASIN COAL REGION

FINAL TECHNICAL REPORT

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PREPARED FOR:

UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
NEW MEXICO STATE OFFICE

BY:

PEI Associates, Inc.
14062 Denver West Parkway, Suite 215
Golden, Colorado 80401

ECOS Management Criteria, Inc.
5300 Orange Avenue, Suite 220
Cypress, California 90630

Enclosure

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SECTION 1

INTRODUCTION AND SUMMARY

1.1 INTRODUCTION

The Bureau of Land Management (BLM) is considering a leasing program of federally owned coal tracts in the San Juan Basin Federal Coal Region of northwestern New Mexico and is preparing a comprehensive regional environmental impact statement (EIS) to analyze the potential effects of the proposed program alternatives. As part of the environmental analysis, ambient air quality and meteorological data were needed in the San Augustin area of the region, where existing air quality and meteorological data are sparse and inadequate for air quality modeling and impact analysis.

Four locations were selected for monitoring stations, and particulate monitoring equipment was set up at these locations to obtain annual data on total suspended particulates (TSP) and suspended particulates smaller than 10 micrometers (μm) in size (PM_{10}). At one of the locations, a meteorological data station was set up to collect meteorological data needed for use with the Climatological Dispersion Model[1] for future air quality modeling analysis. The monitoring equipment was operated for a one year period, from February 12, 1985 to February 13, 1986.

1.2 SUMMARY

Particulate concentrations were well within the Federal and State ambient air quality standards. Table 1-1 shows the maximum 24-hour concentrations experienced at the four sites.

TABLE 1-1. MAXIMUM 24-HOUR TSP CONCENTRATIONS

Site	Concentration	Sample date
Bread Springs	88 $\mu g/m^3$	06-12-85, 11-09-85
Quemado 1	60 $\mu g/m^3$	07-06-85
Quemado 2	51 $\mu g/m''$	06-30-85
Ft. Wingate	50 $\mu g/m^3$	06-18-85

Four of the five highest readings occurred within a one month period between June 12 and July 6, 1985. This result was not unexpected since dust generated from vehicles on dirt roadways is one of the major particulate sources in rural areas. The site with the highest annual geometric mean was Bread Springs with a concentration of 28 $\mu g/m^3$. This is less than half the concentration allowed in New Mexico's ambient air quality standard. Table 1-2 displays an annual summary table for particulate concentration data.

TABLE 1-2. ANNUAL SUMMARY OF PARTICULATE DATA

Site	Sampler	Arithmetic Mean	Standard Deviation	Geometric Mean	Standard Geometric Deviation
Bread Springs	BS1	33.5	19.7	28.3	1.8
Quemado 1	HV1	20.0	13.6	15.8	2.0
Quemado 1	HV2	18.2	12.5	14.5	2.0
Quemado 1	SSI2	10.9	6.9	8.9	2.0
Quemado 2	E10694	15.3	11.5	10.9	2.5
Ft. Wingate	TSP1	16.4	10.8	13.5	1.9
Ft. Wingate	TSP2	16.6	11.3	13.3	2.0
Ft. Wingate	SSI	10.0	6.1	8.2	2.0

Evidence of long range transport of pollutants was experienced with data collected the week of the June 30, 1985 sample run. On the June 30 sample day the 24-hour concentrations for all sample sites were more than twice the site's annual arithmetic mean. An air stagnation advisory was in effect for the Gallup area and long range pollutant transport from Southern California was theorized by the news media.

The wind rose calculations and the wind rose are shown in Figure 1-1. The hourly data indicates a diurnal wind flow pattern with easterly daytime winds and westerly night time winds being common. This observation is confirmed with the wind rose data. This phenomenon can be partially attributed to the geographic features and the east-west orientation of the Hubble draw.

A summary of the windspeed, precipitation and temperature data are shown in Table 1-3. Monthly and annual summaries were calculated. As indicated in the data summary, lightning damage resulted in significant meteorological data losses during the summer months of the study.

The particulate data indicates an air quality in the area that is well within federal and state air quality limits. Except in the case of infrequent long range pollutant transport occurrences, most of the particulates generated were emitted from traffic on dirt roads and by domestic wood burning. Since most of the high particulate concentrations occurred in the summer months, fugitive emissions from roadways appear to be the primary particulate source in the area.

WIND ROSE CALCULATIONS

Station : QUEMADO NEW MEXICO

Start Date: 21885 End Date: 21586

Start Hour: 1 End Hour: 24

	2-7 mph		8-11 mph		12-25 mph		>25 mph		Total	
W-Dir.	Hrs	%	Hrs	%	Hrs	%	Hrs	%	Hrs	
N	85	1.18	15	0.21	2	0.03	1	0.01	103	1.43
NNE	63	0.87	13	0.18	7	0.10	0	0.00	83	1.15
NE	163	2.26	15	0.21	4	0.06	1	0.01	183	2.54
ENE	962	13.36	61	0.85	4	0.06	0	0.00	1027	14.26
E	1389	19.29	79	1.10	42	0.58	0	0.00	1510	20.97
ESE	428	5.94	53	0.74	37	0.51	0	0.00	518	7.19
SE	88	1.22	34	0.47	28	0.39	0	0.00	150	2.08
SSE	72	1.00	28	0.39	19	0.26	2	0.03	121	1.68
S	71	0.99	35	0.49	59	0.82	2	0.03	168	2.33
SSW	93	1.29	47	0.65	89	1.24	2	0.03	233	3.24
SW	176	2.44	76	1.06	113	1.57	6	0.08	374	5.19
WSW	353	4.90	286	3.97	215	2.99	37	0.51	903	12.54
W	269	3.74	264	3.67	336	4.67	18	0.25	894	12.41
WNW	157	2.18	105	1.46	214	2.97	6	0.08	485	6.73
NW	123	1.71	88	1.22	95	1.32	0	0.00	306	4.25
NNW	84	1.17	37	0.51	17	0.24	0	0.00	138	1.92
	4576	63.54	1236	17.16	1281	17.79	75	1.04	7196	99.92
Calm Hours									6	0.08

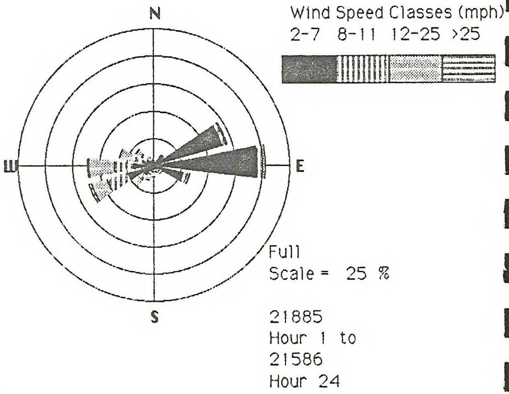

Figure 1-1. Wind Rose With Calculations.

TABLE 1-3. SUMMARY OF WINDSPEED, PRECIPITATION AND TEMPERATURE DATA

SUMMARY DATA MONTHLY AND ANNUAL
QUEMADO, NEW MEXICO
3/85 - 2/86

MO = JAN	PRECIPITATION :	MEAN= .0	MAX= .0	MIN= .0	NUMBER OF DATA POINTS= 744
	TEMPERATURE :	MEAN= 30.1	MAX= 66.0	MIN= 3.0	NUMBER OF DATA POINTS= 744
	WIND SPEED :	MEAN= 6.0	MAX= 29.0	MIN= 2.0	NUMBER OF DATA POINTS= 744
MO = FEB	PRECIPITATION :	MEAN= .1	MAX= 11.0	MIN= .0	NUMBER OF DATA POINTS= 665
	TEMPERATURE :	MEAN= 31.9	MAX= 56.0	MIN=-11.0	NUMBER OF DATA POINTS= 665
	WIND SPEED :	MEAN= 7.3	MAX= 27.0	MIN= 1.0	NUMBER OF DATA POINTS= 665
MO = MAR	PRECIPITATION :	MEAN= .0	MAX= 4.0	MIN= .0	NUMBER OF DATA POINTS= 744
	TEMPERATURE :	MEAN= 39.7	MAX= 66.0	MIN= 11.0	NUMBER OF DATA POINTS= 744
	WIND SPEED :	MEAN= 10.2	MAX= 34.0	MIN= 2.0	NUMBER OF DATA POINTS= 744
MO = APR	PRECIPITATION :	MEAN= .2	MAX= 50.0	MIN= .0	NUMBER OF DATA POINTS= 709
	TEMPERATURE :	MEAN= 48.4	MAX= 74.0	MIN= 18.0	NUMBER OF DATA POINTS= 709
	WIND SPEED :	MEAN= 9.9	MAX= 32.0	MIN= 2.0	NUMBER OF DATA POINTS= 709
MO = MAY	PRECIPITATION :	MEAN= .1	MAX= 8.0	MIN= .0	NUMBER OF DATA POINTS= 720
	TEMPERATURE :	MEAN= 44.6	MAX= 86.0	MIN= .0	NUMBER OF DATA POINTS= 89
	WIND SPEED :	MEAN= 9.0	MAX= 38.0	MIN= .0	NUMBER OF DATA POINTS= 744
MO = JUN	PRECIPITATION :	MEAN= .0	MAX= 7.0	MIN= .0	NUMBER OF DATA POINTS= 696
	TEMPERATURE :	MEAN= .0	MAX= .0	MIN=999.0	NUMBER OF DATA POINTS= 0
	WIND SPEED :	MEAN= 8.3	MAX= 25.0	MIN= 2.0	NUMBER OF DATA POINTS= 698
MO = JUL	PRECIPITATION :	MEAN= .5	MAX= 82.0	MIN= .0	NUMBER OF DATA POINTS= 740
	TEMPERATURE :	MEAN= .0	MAX= .0	MIN=999.0	NUMBER OF DATA POINTS= 0
	WIND SPEED :	MEAN= 8.0	MAX= 27.0	MIN= 2.0	NUMBER OF DATA POINTS= 446
MO = AUG	PRECIPITATION :	MEAN= .1	MAX= 20.0	MIN= .0	NUMBER OF DATA POINTS= 744
	TEMPERATURE :	MEAN= .0	MAX= .0	MIN=999.0	NUMBER OF DATA POINTS= 0
	WIND SPEED :	MEAN= .0	MAX= .0	MIN=999.0	NUMBER OF DATA POINTS= 0
MO = SEP	PRECIPITATION :	MEAN= .2	MAX= 11.0	MIN= .0	NUMBER OF DATA POINTS= 720
	TEMPERATURE :	MEAN= 54.1	MAX= 90.0	MIN= 25.0	NUMBER OF DATA POINTS= 638
	WIND SPEED :	MEAN= 7.7	MAX= 24.0	MIN= 2.0	NUMBER OF DATA POINTS= 563
MO = OCT	PRECIPITATION :	MEAN= .1	MAX= 17.0	MIN= .0	NUMBER OF DATA POINTS= 739
	TEMPERATURE :	MEAN= 47.2	MAX= 74.0	MIN= 23.0	NUMBER OF DATA POINTS= 739
	WIND SPEED :	MEAN= 6.5	MAX= 31.0	MIN= .0	NUMBER OF DATA POINTS= 722
MO = NOV	PRECIPITATION :	MEAN= .0	MAX= 5.0	MIN= .0	NUMBER OF DATA POINTS= 720
	TEMPERATURE :	MEAN= 35.3	MAX= 68.0	MIN= 7.0	NUMBER OF DATA POINTS= 720
	WIND SPEED :	MEAN= 8.7	MAX= 31.0	MIN= 2.0	NUMBER OF DATA POINTS= 718
MO = DEC	PRECIPITATION :	MEAN= .0	MAX= 3.0	MIN= .0	NUMBER OF DATA POINTS= 744
	TEMPERATURE :	MEAN= 24.9	MAX= 85.0	MIN=-20.0	NUMBER OF DATA POINTS= 744
	WIND SPEED :	MEAN= 5.7	MAX= 30.0	MIN= 1.0	NUMBER OF DATA POINTS= 725
ANNUAL	PRECIPITATION :	MEAN= .1	MAX= 82.0	MIN= .0	NUMBER OF DATA POINTS=8685
	TEMPERATURE :	MEAN= 38.8	MAX= 90.0	MIN=-20.0	NUMBER OF DATA POINTS=5792
	WIND SPEED :	MEAN= 7.9	MAX= 38.0	MIN= .0	NUMBER OF DATA POINTS=7478

UNITS : PRECIPITATION (0.01 INCHES)
TEMPERATURE (DEG F.)
WIND SPEED (MPH)
999 = NO DATA

SECTION 2

SITE SELECTION AND SITE DESCRIPTIONS

2.1 SITE SELECTION

Sampling sites were selected by Keith Rosbury of PEI and Chris Anderson of BLM during a visit to the area October 29 and 30, 1984. Areas considered for monitoring sites included Chaco, Zuni Pueblo, Gallup, Ft. Wingate, and Quemado. Siting selection for the particulate monitors was based upon requirements stated in Part II of 40 CFR part 58 as follows:

1. Inlet must be 2 to 15 meters above ground level.
2. On rooftop locations sampler must be at least 2 meters from walls & rooftop structures.
3. On rooftops, note any furnace or incinerator flues nearby. Avoid impaction from flue emissions.
4. Samplers should be located at least 20 meters from trees.
5. Sampler must be located away from buildings & obstructions. Distance from buildings must be two times the height of the object.
6. There must be unrestricted air flow in an arc of at least 270° around the sampler.
7. Note and avoid any point sources of particulates in the vicinity of the sampler ie: industrial sources, smoke stacks, unpaved playgrounds & parking areas.
8. Note sampler proximity to roadways. Samplers should be located away from busy roadways (3,000 vehicles/day). In the case of elevated roadways, samplers should be located at least 25 meters from the closest traffic lane if the roadway is above the sampling location.
9. Samplers should not be located in unpaved areas unless there is vegetative ground cover year round.

In addition to the required siting considerations, because of the

remote location of some of the monitoring sites, the following considerations were also evaluated in the site selection process:

1. The availability of continuous 115 volt power with a minimum of 30 amperes service is required for the site containing 2 hi-volume samplers, one SSI, and a meteorology station.
2. Sites subject to vandalism must be secure to deter damage attempts.
3. The sites must be located relatively close to dwellings to provide the availability and accessibility of local operators.

Gallup (Bread Springs), Ft. Wingate, and Quemado were areas chosen for sampler site locations. Chaco was eliminated from consideration since 3 to 4 years of hi-volume data had already been collected before the site was removed early in 1984. It was thought that an adequate historical data base for the area existed and that data should be collected elsewhere. It was felt that the Bread Springs and Ft. Wingate sites were in close enough proximity to Zuni Pueblo to satisfy monitoring requirements. The sites at Ft. Wingate and Bread Springs were preferred since they offered good site security, had access to power, and had the availability of reliable site operators.

2.2 SITE DESCRIPTIONS

2.2.1 Bread Springs School

A single hi-volume particulate sampler was operated at the Bureau of Indian Affairs (BIA) School at Bread Springs, 9 miles southeast of Gallup. The sampler was located on a four foot high platform inside of a fenced enclosure beside a water tower. This location was 300 ft away from the school and its associated activity areas and was 75 feet from the closest dwelling.

This site was found to have the highest concentrations of suspended particulates of the four sites. The area around this site was more densely

populated than that of the other three sites. Native population activities influenced particulate pollutant generation through domestic wood burning and through vehicular travel over dirt roads.

2.2.2 Fort Wingate

Two hi-volume samplers and one 10 µm size selective inlet (SSI) sampler were operated at the Ft. Wingate Work Center, of the Mt. Taylor Ranger District. The Work Center was located 2 miles west of the Ft. Wingate High School approximately 9 miles east southeast of Gallup. The hi-volume samplers were designated as TSP1 and TSP2. TSP2 was a collocated sampler used to determine the precision of the measurement technique. The hi-volume samplers were the property of the State of New Mexico, Environmental Improvement Division, and were loaned to the Bureau of Land Management (BLM) for the duration of the monitoring.

This site was in a more heavily wooded area than the other three sites. The samplers were moved from the roof of a well house to the roof of a garage after the first quarter of data collection so the samplers could be operated farther away from surrounding trees. Both structures were one story buildings with flat roofs 10 feet above ground level. The site was secure and had limited access by the general public.

2.2.3 Hubbell Ranch

Two sites were located on the Hubbell Ranch, 11 miles north northwest of Quemado. The sites were located in a wide basin known as Hubbell Draw. The area was used as rangeland and had few trees.

The first site, Quemado 2, was located between the forks of two dirt roads which diverged 10 miles west of New Mexico State Route 117. The single hi-volume sampler was well exposed, mounted on a four foot high platform in an

open field beside an abandoned windmill tower. The sampling site was located 100 yards from the dirt roadways. The closest dwelling was one mile away.

The second site on the Hubbell Ranch, Quemado 1, was located four miles west of the Quemado 2 site and one mile east of the Hubbell Ranch main buildings. This site was located in an open horse pasture, fifty yards south of the dirt road, and contained two hi-volume samplers, a 10 μm SSI sampler and a meteorological data recording station which continuously recorded wind speed, wind direction, temperature, and precipitation data.

The hi-volume samplers were identified as HV-1 and HV-2. The second sampler, HV-2, was a designated collocated sampler to check the precision of the sampling method. Thus the two sites together comprise the Quemado monitoring station (on some of the data sheets, these sites are referred to as Hubbell 1 and Hubbell 2 or Hubble 1 and Hubble 2).

Preliminary arrangements were made by Messrs. Rosbury and Anderson during the October visits for PEI to use the land for monitoring purposes, to obtain the power to operate the sites, and to contract with local operators to perform site operations. A follow-up visit was made by Ron Lawler-Heavner, the PEI field operation manager, December 3-5 to make final arrangements for power drops and to sign contractural agreements with site operators and site owners. Plans were made to perform site set-ups, initial monitor calibrations, and site operator training as soon as all of the monitoring equipment was delivered.

SECTION 3

EQUIPMENT PROCUREMENT

Bids were received from all of the major manufacturers of particulate sampling equipment so costs could be evaluated and orders placed as soon as the contract was signed. The authorized start date was October 29, 1984 and on that date, an order was placed with Anderson Samplers, Inc., for the procurement of 4 hi-volume samplers and 2 PM_{10} SSI samplers, all of which were equipped with mechanical timers, flow controllers, and Dickson flow recorders. The remaining two hi-volume samplers used in the PSD monitoring effort were borrowed from the State of New Mexico, Environmental Improvement Division. A particulate monitor procurement list is shown in Table 3-1.

The meteorological sensors, power supply, and signal conditioning unit were purchased from Climatronics Corporation since the equipment was on a government contract list. Supplemental equipment included a 10 meter aluminum tower, a grounding kit, a circuit protector for wind speed and wind direction sensors, and a weatherproof aluminum junction box to enclose the mainframe, signal conditioners, and power supply. A meteorological equipment procurement list is shown in Table 3-2.

Two dual pen Leeds & Northrup recorders, chart paper, and recorder pens were purchased to record the four meteorological parameters. The recorders were selected because of their weatherproof design, the compactness of the two pen design, and the full size chart width (6.5 inches) to provide high resolution of data and to facilitate ease of data reduction. The recorders also had

TABLE 3-1. PARTICULATE MONITOR PROCUREMENT LIST

Quantity	Description	Model No.
4	Hi-volume samplers complete with flow controllers mechanical timers Dickson flow recorders	UV-2H
2	PM_{10} SSI sampler complete with flow controllers mechanical timers Dickson flow recorders	UV11-H
2	*Hi-volume samplers complete with mechanical timers voltage transformers visi floats	GMW2000

* On loan from State of New Mexico Environmental Improvement Division

TABLE 3-2. METEOROLOGICAL EQUIPMENT PROCUREMENT LIST

Quantity	Description	Model No.
1	F460 wind speed sensor with anemoneter cups	100075
1	F460 wind direction sensor with vane	100076
1	F460 crossarm, prewired	100487
1	Temperature sensor (dual element thermistor)	100093
1	Naturally aspirated temperature shield	100552
1	Precipitation gauge, 6" collector with heater	100508-1
1	F460 windspeed (0-100 mph), wind direction (0-540°) transistor card	100163
1	Temperature (-20 to 120°F) translator card	100087
1	Precipitation integrator (0-1 inch)	100747
1	Component mainframe	100081
1	Power supply ±12 volt DC	101074
1	Environmental cabinet, thermostatically heated with mounting hardware	100730-1
1	Signal line surge protection	101384
1	Aluminum tower (10 meter)	C-33
1	Full height grounding kit, 10 meter	100924

an excellent record of reliability in field environments. A chart recorder procurement list is shown in Table 3-3.

Particulate filters were ordered from Schleicher & Schuell through PEI's Cincinnati analytical lab. The filters were inspected, numbered, conditioned, weighed, and stored following procedures outlined in Section 2.2.3 of the EPA QA Handbook[2]. The filters were then shipped to the PEI Denver office for distribution to the site operators.

Because of the Thanksgiving and Christmas holidays, delays were experienced in the delivery of most of the site supplies. Most of the equipment was delivered to the PEI Denver office in January 1985. However, meteorological instrumentation was air expressed to the Albuquerque airport by the manufacturer on February 6th.

TABLE 3-3. CHART RECORDER PROCUREMENT LIST

Quantity	Description
2 each	Series 165 2 channel chart recorders, 0-1 volt input
10 rolls	Chart paper (0-100 uniform scale) for windspeed and precipitation
10 rolls	Chart paper, custom printed (alternating) 0 to 540 degrees for wind direction, -20 to 120 degrees for temperature
6 each	Blue ink pens
6 each	Red ink pens

SECTION 4

FIELD SAMPLING PROCEDURES

4.1 SITE SET-UP

It was expected that all of the equipment that had been ordered would be received in Denver in mid-January. Since some of the vendors had production and shipping delays, site set-up was scheduled for the week of January 21, 1985. When the set-up crew departed Denver Monday, January 21, the particulate samplers and the chart recorders had been received, however, the only component of the meteorological system in-house at that time was the 10 meter tower.

The two sites on the Hubbell ranch were set-up January 23 and 24. Site set-up of Quemado 1 consisted of the following:

1. Assembled the TSP and PM_{10} samplers and securely fastened samplers to platforms.
2. Built a fence around the samplers to keep the horses from interfering with the samplers and from destroying the ground covering and vegetation.
3. Built and painted a shelter to enclose the meteorological component cabinet, the chart recorders, and the recorder supplies (chart paper and pens).
4. Secured the base of the meteorological tower into the ground.

At this time, the power drop had not yet been provided by the electrical contractor and the power company. These parties were contacted and urged to

expedite power provisions for the site.

The Quemado 2 monitoring site consisted of one TSP hi-volume sampler. The sampler was assembled and securely fastened to a platform, a fence was erected around the sampler, and an underground power cable was buried between the sampler and the adjacent abandoned windmill which had since been replaced with an electric pump. Arrangements had previously been made for land use and power use with the Hubbell Ranch Corporation.

The monitoring sites located at the Bread Springs School and at Ft. Wingate were set-up January 25. Since no fences had to be erected, the SSI sampler at Ft. Wingate was assembled, secured to a wooden pallet, and hoisted to the roof of the old well house. The sampler at Bread Springs was secured to a platform inside of the fenced area at the base of the water tower. Power at these two sites had been provided and power cords were secured between the power sources and the air samplers.

The remainder of the meteorological instrumentation was still not delivered at this time. The vendor stated that the equipment was scheduled for shipment the week of February 4. The set-up crew returned to Denver and arrangements were made to air freight the instrumentation to Albuquerque for pick-up.

The PEI field operations manager returned to Albuquerque February 6th, picked up the remaining equipment, and met with Chris Anderson of BLM. The hi-volume samplers provided by the State of New Mexico were secured at the Ft. Wingate site and Chris accompanied PEI personnel while local operators were trained and he assisted with the installation of the meteorological instrumentation and support equipment at the Hubble 1 site. PEI personnel worked through the weekend performing instrument calibrations and training the local

operators. All monitoring systems were operational and on-line for the first day of monitoring, February 12.

4.2 MONITOR CALIBRATIONS AND OPERATOR TRAINING

All TSP hi-volume and 10 μm SSI particulate samplers were calibrated before monitoring began and quarterly thereafter following procedures specified in Section 2.2.2 of the EPA QA manual[2]. All flow calibrations were performed with an orifice calibrator using five restricting plates to vary the sampler flow rate. The calibration orifice was factory calibrated and was verified for accuracy by the EPA Region VIII Quality Assurance Laboratory. Sampler calibrations are presented in Appendix A.

The site operators witnessed the sampler calibrations and were instructed in the theory of sampler calibration and operation. Although the site operator's responsibilities were to simply change the sample filters for each sample day, it was felt that the additional instruction on the operation of the sampler would be beneficial in troubleshooting monitor malfunctions and would prevent future diagnostic trips to the sampling sites by the field manager. This proved to be worthwhile and on several occasions, replacement parts were sent to and installed by the local operator, preventing costly unscheduled maintenance trips.

4.3 STANDARD OPERATING PROCEDURES

After sampler calibrations, the local operators were provided with written instructions for Operating Procedures for the Conventional Hi-Volume Sampler from Section 2.3 of the "Inhalable Particulate Network Operations and Quality Assurance Manual"[3]. A copy of these instructions as they were presented to the site operators is contained in Appendix B. The site operators

were shown how to perform the step-by-step procedure by the PEI field manager and were then observed performing the procedure as they followed the written guidelines. After the monitoring program was implemented and the PEI field manager returned to Denver, site operators were called weekly to discuss the sampling procedure and to answer any procedural questions as they arose.

Additional training was given to the site operator of Hubble 1, the site containing the meteorological instrumentation and data recording system. Operator duties included changing chart paper on the recorders every 4 to 5 weeks and performing zero, span, operational, and maintenance checks on the instruments on a weekly basis when the site was visited to perform filter changes. A checklist was completed by the operator durings each site visit to assist in and to provide a written record of the meteorological data system performance. A copy of the checklist form is included in Appendix C.

SECTION 5

DATA HANDLING AND PROCESSING

5.1 TSP AND PM_{10} DATA

The local operators were required to change the sample filters and the Dickson flow recording charts in the five day period between the 24-hour sample runs. The two TSP samplers on loan from the State of New Mexico were not equipped with Dickson charts but had rotameters. For these samplers, the operator recorded an average flow rate before and after each sample run. In addition to changing sample filters, the local operators recorded data on TSP hi-vol data sheets, a sample of which is shown in Figure 5-1. The operator recorded the sample date, filter number, elapsed time meter reading, meteorological information, and made comments on parameters which may have influenced the filter particulate loading.

The particulate filters were placed in sample envelopes and mailed by the local operator to the PEI Denver office each week and were then forwarded to the analytical laboratory for final gravimetric analysis. The TSP hi-vol data sheets were sent to the PEI field project manager each month.

As the particulate filters and the TSP hi-vol data sheets were received in the PEI Denver office, the data was entered into an Apple IIe personal computer using the Multiplan software spreadsheet[4]. This spreadsheet was set-up to calculate run time, average sampler flow rate, net filter weight, and particulate concentration. A sample of the complete spreadsheet for a calendar quarter is shown in Figure 5-2. These spreadsheets were summarized

TSP Hi-Vol

Site Number: ____________________ Location: ____________________ Sampler S/N: ____________________

Flow rate: Set Dickson reading at ____________________ for 1.42 m^3/min.

Date	Initials	Filter number	Average Dickson reading	Elapsed time, minutes	Remarks

Use a new data sheet whenever Dickson setpoint is changed. Return data sheets to MD–76 at RTP monthly.

Figure 5-1. Hi-vol Data Sheet.

SITE:	HUBBELL 1	CAL DATE:	02-11-85	05-22-85	QUARTER 2	HUBBELL 1
SAMPLER:	HV1	'M' VALUE	0.9777	1.1132	85	HV1
		'B' VALUE	5.7000	0.8390		

DATE	FILTER NUMBER	TARE WT.GRAMS	GROSS WT.GRAMS	START TIME	END TIME	AVG.CHART READING	NET WT.GRAMS	RUN TIME	AVG.FLOW RATE M3/MN	CONC UG/M3	LOG (CONC)
04-01-85	4011165	4.1493	4.1654	11683.7	13089.4	36.00	0.0161	1405.7	0.8777	13.05	1.1156
04-07-85	4011161	4.1171	4.1408	13089.4	14497.9	46.00	0.0237	1408.5	1.1673	14.41	1.1588
04-13-85	4011157	4.0870	4.1184	14497.9	15906.9	46.00	0.0314	1409.0	1.1673	19.09	1.2808
04-19-85	4010977	4.2119	4.2427	15906.9	17318.9	45.50	0.0308	1412.0	1.1528	18.92	1.2769
04-25-85	4010974	4.2193	4.2770	17318.9	18727.8	46.00	0.0577	1408.9	1.1673	35.08	1.5451
05-01-85	4010970	4.2154	4.2344	18727.8	20131.1	46.00	0.0190	1403.3	1.1673	11.60	1.0644
05-07-85	4010966	4.2398	4.2789	20131.1	21539.0	46.00	0.0391	1407.9	1.1673	23.79	1.3764
05-13-85	4011027	4.2015	4.2288	21539.0	22945.9	45.50	0.0273	1406.9	1.1528	16.83	1.2261
05-19-85	4011032	4.2030	4.2350	22945.9	24351.8	45.50	0.0320	1405.9	1.1528	19.74	1.2954
05-25-85	4011036	4.1703	4.2220	24488.0	25898.7	47.50	0.0517	1410.7	1.1870	30.87	1.4896
05-31-85	4011044	4.1314	4.1694	25898.7	27306.4	47.00	0.0380	1407.7	1.1743	22.99	1.3615
06-06-85	4011048	4.1008	4.1338	27306.4	28713.9	47.50	0.0330	1407.5	1.1870	19.75	1.2956
06-12-85	4010952	4.1819	4.2382	28713.9	30119.6	47.50	0.0563	1405.7	1.1870	33.74	1.5282
06-18-85	4010956	4.1572	4.2389	30119.6	31527.0	47.50	0.0817	1407.4	1.1870	48.90	1.6893
06-24-85	4010960	4.2066	4.2806	31527.0	32933.3	45.50	0.0740	1406.3	1.1361	46.31	1.6657
06-30-85	4011397	4.2508	4.3333	32933.3	34339.4	45.00	0.0825	1406.1	1.1234	52.23	1.7179
'N'										16	
ARITH.MEAN										26.71	
STD.DEV										13.08	
GEOM.MEAN										24.01	
SGD										1.60	

Figure 5-2. Spreadsheet for a Calendar Quarter

to show sample date and concentration only. All particulate summary data sheets are displayed in Appendix D. Particulate data summaries were displayed in Section 1.2.

5.2 METEOROLOGICAL DATA

Strip charts for windspeed, wind direction, temperature, and precipitation were changed by the local operator every 4 to 5 weeks. They were then either mailed or hand carried to the field project manager in Denver. The charts were examined and reviewed for proper time synchronization and data completeness and were compared with information completed by the field operator on the meteorological data check list. Hourly averages for windspeed, temperature, and precipitation parameters were manually determined and entered onto 80 column computer loading forms. Wind direction data was digitized using a summagraphics ID digitizer linked to an IBM compatible personal computer. For each hour of data, an average of ten data points were digitized and saved to floppy disk. A mean and standard deviation were calculated for each hour to determine the stability class. The mean wind direction and the stability class determinations were transferred to the 80 column computer loading forms. The data were keypunched and transferred to magnetic tape. The tape was then forwarded to the PEI meteorologist in Cincinnati where the computer summaries were generated.

A program was written based primarily on a paper by Mitchel and Timbre[5]. The program used a modified approach similar to Mitchel and Timbre but included the effects of solar altitude which contributes to convective mixing. The program calculated solar altitude on the basis of the day of the year, the time of day, and site longitude and latitude. These data were used along with

the standard deviation of the horizontal winds direction fluctuation (sigma theta) and windspeed to determine stability class.

The program was expanded using a stability array (STAR) to tabulate joint frequency distributions of windspeed, wind direction, and stability class. Calms were distributed as they are in STAR by evenly distributing them over the first windspeed category and weighing the distribution by the summary of the first two categories. Windspeed categories were assigned the same ranges as STAR. The number of stability categories was six, namely A, B, C, D/day, D/night and E and F combined. Additionally, the wind rose data and the wind rose were derived using programs developed for the MacIntosh personal computer.

Stability class data are displayed in Appendix E and are also provided on a 5.25 inch floppy disk. The annual wind rose calculations and the wind rose were shown in Section 1.2. The summary data for temperature, precipitation, and windspeed were also shown in Section 1.2. Both monthly and annual summaries were presented for windspeed, temperature, and precipitation.

5.3 DATA COMPLETENESS

Particulate samplers were put on line February 12, 1985 and sampled every six days until February 12, 1986 for a total of 62 filters for each particulate sampler. A summary of particulate sampler data loss is shown in Table 5-1. Out of a total of 496 samples, 26 were not collected or were unacceptable for data input. This resulted in a 95 percent data capture.

Meteorological data capture is summarized in Table 5-2. Although a tower grounding kit was purchased and installed properly, the three sensors located on the aluminum meteorological tower all suffered damage and data loss because of lightning. Additionally, a signal protection device had been purchased and

TABLE 5-1. SUMMARY OF PARTICULATE SAMPLER DATA LOSS

Site	Sampler	Date	Reason for data loss
Bread Springs	BSI	06-06-85	Site operator on vacation, filter ran twice
Ft. Wingate	TSP1	04-26-85	Site operator on assignment, filter ran twice
Ft. Wingate	TSP2	04-26-85	Site operator on assignment, filter ran twice
Ft. Wingate	SSI	04-26-85	Site operator on assignment, filter ran twice
Ft. Wingate	TSP1	07-30-85	Site operator on assignment, filter ran twice
Ft. Wingate	TSP2	07-30-85	Site operator on assignment, filter ran twice
Ft. Wingate	SSI	07-30-85	Site operator on assignment, filter ran twice
Ft. Wingate	TSP1	08-29-85	Flow rate malfunction
Ft. Wingate	TSP1	12-03-85	Site operator on assignment, filter ran twice
Ft. Wingate	TSP2	12-03-85	Site operator on assignment, filter ran twice
Ft. Wingate	SSI	12-03-85	Site operator on assignment, filter ran twice
Ft. Wingate	SSI	01-08-86	Flow controller and/or Dickson chart malfunction
Ft. Wingate	SSI	02-07-86	Flow controller and/or Dickson chart malfunction
Hubble I	SSI2	02-18-85	Flow rate malfunction
Hubble I	HV1	09-04-85	Operator error, missed sample day
Hubble 1	HV2	09-04-85	Operator error, missed sample day
Hubble I	SSI2	09-04-85	Operator error, missed sample day
Hubble I	SSI2	09-10-85	Flow rate malfunction
Hubble I	SSI2	09-16-85	Flow rate malfunction
Hubble I	SSI2	10-28-85	Flow controller and/or Dickson chart malfunction
Hubble I	SSI2	12-27-85	Flow controller and/or Dickson chart malfunction
Hubble I	SSI2	01-26-86	Flow controller and/or Dickson chart malfunction
Hubble I	SSI2	02-07-86	Flow rate malfunction
Hubble II	E10694	09-04-85	Operator error, missed sample day
Hubble II	E10694	12-15-85	Flow controller and/or Dickson chart malfunction
Hubble II	E10694	02-13-86	Flow controller and/or Dickson chart malfunction

installed in-line between the windspeed and wind direction sensors and the signal conditioning unit, power supply, and mainframe. As a result of these electrical surge protection devices being used, all damage was confined to the sensors and no damage was incurred by the mainframe components.

TABLE 5-2. SUMMARY OF METEOROLOGICAL PARAMETER DATA CAPTURE

Percent Data Capture	
Precipitation	99.1%
Temperature	66.1%
Windspeed	85.4%
Wind direction	82.2%
Stability class	82.2%

The precipitation collector was mounted on top of the wooden shelter which housed the meteorological mainframe and the data chart recorders. The only data loss experienced by the precipitation recording system was during momentary power outages during electrical storms and while work was being performed by the power company on the transmission line. Although less than one percent of the total data collected was reported lost, some of this data was during periods of precipitation when lightning and wind caused site power loss. This loss of data possibly biases the reported precipitation accumulation averages towards lower than actual accumulations.

All other data losses to windspeed, wind direction, and temperature were directly linked to sensor damage by lightning. The temperature sensor was first damaged by lightning in a storm on May 1. The sensor was returned to the vendor and repaired under warranty. The sensor was replaced and put back on line on June 23. Data collected from June 23 to July 12 was questionable and was voided. On July 12, the site was again struck by lightning which damaged the wind direction sensor and possibly, caused further damage to the

temperature probe. Another storm on July 19 damaged the windspeed sensor. Only precipitation data were collected and validated in the period from July 19 to September 4 when the repaired sensors were received from the manufacturer and were installed and verified by the PEI field project manager. The system and its components were thoroughly checked and re-checked between September 4 and 7. All data collection systems operated from September 7 through the end of the study period with only short, temporary data losses.

SECTION 6.0

QUALITY ASSURANCE

6.1 QUALITY ASSURANCE FOR PARTICULATE MONITORS

The quality assurance (QA) program used for the particulate samplers in this monitoring study was based upon QA requirements outlined in Volume II of the Quality Assurance Handbook for Air Pollution Measurement Systems[2] and in Part 58 of Chapter 1 of Title 40 of the Code of Federal Regulations (CFR) Appendix B entitled "Quality Assurance Requirements for Prevention of Significant Deterioration (PSD) Monitoring". Although no formal QA plan was written for this project, guidelines specified in Volume II of the QA handbook were followed during:

1. Sampling network design and site selection.
2. Site set-up and site operator training.
3. Data handling and reporting.
4. Chain-of-custody procedures for particulate filters and meteorological data charts.
5. Calibrations of the particulate samplers and of the calibration orifice.
6. Laboratory analysis of particulate filters.
7. Performance audits of particulate samplers.
8. Data reduction and evaluation of meteorological chart data.
9. Operation and collocated particulate samplers.

Network site location selection QA procedures were based on requirements

as stated in Part II of 40 CFR part 58 as discussed in Section 2.0 of this report. The network design included two collocated TSP monitoring sites. Although PSD requirements specified only one collocated site with this size of network, the collocated site is supposed to be the site exposed to the maximum TSP concentrations. Since it was difficult to determine which of the four monitoring sites would be in the area of maximum concentrations, it was decided to locate the collocated monitors at the two sites where the PM_{10} SSI samplers were located. This would double the chances of selecting the site with the maximum concentrations and would also act as a back-up for data collected to enhance the PM_{10} monitoring effort.

During site set-up, siting criteria and monitor location requirements were again evaluated to verify adequate exposure and the absence of interferences with the monitoring methods. Site operators were thoroughly trained and given written step-by-step instructions on site operations.

Site operators were called weekly during the first month of the project to evaluate their understanding of the sampling procedures and were instructed to call the PEI field project manager collect whenever any questions or problems arose. Close communication between the field project manager and the site operators supported the total QA effort.

Data analysis for the particulate data involved multiple steps in the data reduction and analysis sequence. Calculations and procedures performed during each step were checked and verified. Whenever possible, the final data product was compared to the raw field data to perform a complete data sequence check.

Filters were weighed before and after sampling following procedures recommended in Section 2.2 of the EPA QA Manual. The orifice used to perform

particulate sampler calibrations was factory calibrated and was then re-calibrated at the EPA Region VIII Quality Assurance Laboratory. Sampler calibrations were performed each calendar quarter. Upon arrival at the site a sampler flow rate check was performed. If the flow rate did not agree within 7 percent of the previous quarter calibration, the sampler was re-calibrated before maintenance was performed. After an acceptable sampler flow rate was evaluated, the sampler motor brushes were replaced, the sampler housing was cleaned, and the Dickson recorder pen was replaced. The sampler was run for a minimum of 30 minutes at a controlled flow rate after motor brush replacement and before sampler calibration.

Performance audits were conducted by the State of New Mexico, Environmental Improvement Division September 5, 1985, December 10, 1985, and February 18, 1986. Audit results for the first two audits are displayed in Appendix F. Results of the February 18, 1986 audit have not yet been received. Federal standards for audit value differences are 7 percent. The State of New Mexico has a more strict limit of 5 percent. Both the September 5 and the December 10 audits had all percent differences less than 7 percent. Each audit had one value between 5 and 7 percent. At Bread Springs on September 5, the audit value varied from the calibrated flow rate of 6.8 percent. On December 10, Bread Springs audit and calibration values differed by 5.2 percent.

Data from hi-vol data forms submitted by the local operators were transferred to the Multiplan spreadsheet. The accuracy of the spreadsheet data was verified by comparing the values from the Dickson chart to the values on the hi-vol data sheet. Both of these forms were considered raw field data since both were completed by the site operators in the field. Random values

from the final spreadsheet were then compared to the field data sheets to ensure the accuracy of the data analysis system.

6.2 QUALITY ASSURANCE FOR METEOROLOGICAL DATA

The meteorological data analysis followed a similar multiple step sequence as was performed with the particulate data. The strip charts served as the original data base to which all values obtained during subsequent data analysis could be verified.

Ten percent of all of the manually reduced data for precipitation, windspeed and temperature were audited by comparing the strip chart values to the values recorded on the 80 column computer loading forms. Whenever errors were found, the data were completely reviewed to detect any additional errors.

To audit the wind direction data that were digitized, one day out of each month was re-digitized following the same procedures. The mean and standard deviation values were compared for the two digitizing efforts. In all cases, values from both sets of digitized data agreed within 5 percent. All standard deviations with values greater than 80 which were calculated by the reduction program were recalculated by hand.

The data keypunched from the 80 column data sheets to magnetic tape were punched and then repunched for verification. Any questionable data were checked against the original strip charts.

REFERENCES

1. Brubaker, Kenneth L., Polly Brown, and Richard R. Cirillo. Addendum to User's Guide for Climatological Dispersion Model. EPA-450/3-77-015. May 1977.

2. U.S. Environmental Protection Agency. Quality Assurance Handbook for Air Pollution Measurement Systems. Volume II: Ambient Air Specific Methods. EPA-600/4-77-027a. May 1977.

3. U.S. Environmental Protection Agency. Inhalable Particulate Network Operations and Quality Assurance Manual. Office of Research and Development. March 1983.

4. Microsoft Multiplan Electronic Worksheet for Apple II. Microsoft Corporation. 1982.

5. Mitchell, E., Jr., and K. O. Timbre. Atmospheric Stability Class from Horizontal Wind Fluctuation. Paper 79-29.2. Presented at the 72nd Annual Meeting of the Air Pollution Control Association, Cincinnati, Ohio. June 24-29, 1979.

APPENDIX A

PARTICULATE SAMPLER FLOW RATE CALIBRATIONS

Before the beginning of sampling and during each calendar quarter thereafter, the particulate samplers were calibrated according to methods and procedures recommended in Section 2.2.2 of the EPA QA Handbook. All calibrations were performed with a hi-vol calibration orifice which had been calibrated on a positive displacement Roots meter.

Where locations are given on data sheets as Hubble 1 and Hubble 2, these are the same as Quemado 1 and Quemado 2.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Bread Springs

Orifice Unit No. 18 D

Calibrated by: R Lawler-Heavner

Sampler No. BS I

Date 02-08-85

Indicator No. Dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b = 1.51

Correlation coefficient of r = 0.99978

$Q_r =$ M = 1.0995I

Temp = 40°F
BP = 586 mm Hg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left/Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r SCFM Flow Rate* ~~cmm~~
1	18		10.6	58	51.1
2	13		8.65	52	46.1
3	10		6.75	46	40.7
4	7		4.35	37.5	32.7
5	5		2.7	30	25.8
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location ft Wingate

Orifice Unit No. 18 D

Calibrated by: R Lawler-Hanover

Sampler No. TSP 1

Date 02-11-85

Indicator No. rotameter
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= -11.27

Correlation coefficient of r = 0.9917

$Q_r =$ m= 1.24 I

Temp: 30°f

BP = 593 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18		8.0	45	45.7
2	13		6.4	37.5	40.9
3	10		5.05	32	36.3
4	7		3.2	24.5	28.9
5	5		2.0	19	22.8
6	0		11.0	57.5	53.6
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location: Ft Wingate

Orifice Unit No. 18 D

Calibrated by: R Lawton-Henover

Sampler No. TSP2

Date 02-11-85

Indicator No. rotameter
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= -8.83

Correlation coefficient of r = 0.994

Q_r = m= 0.9747 I

Temp = 30°F

BP= 593 mm Hg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18		10.3	40	51.9
2	13		8.1	35	46.0
3	10		6.3	30	40.5
4	7		4.0	23	32.3
5	5		2.4	16.5	25.0
6	0		14.4	53	61.3
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location ft Wingate

Orifice Unit No. 18 D

Calibrated by: R Lamb-Hauwar

Sampler No. SSI

Date 02-11-85

Indicator No. Dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b = -0.113

Correlation coefficient of r = 0.9972

Q_r = m = 1.119 I

Temp = 30°f

BP = 593 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18		11.6	60.5	55.0
2	13		9.4	55	49.5
3	10		6.7	47	41.8
4	7		4.45	38.5	34.1
5	5		2.7	31	26.5
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble Ranch 1

Orifice Unit No. 18 D

Calibrated by: Rhonda Heim

Sampler No. HV 1

Date 02-11-85

Indicator No. Dickson
(Rotameter/Recorder)

Q_r = aI ± b b = 5.70

Correlation coefficient of r = 0.9997

Q_r = m = 0.9777 I

Temp = 40°F

BP = 603 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left Right	Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18		12.4	61	566
2	13		9.7	54.5	50.2
3	10		7.6	49.5	44.5
4	7		4.8	40.5	35.3
5	5		2.95	32.5	27.7
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble Ranch 1

Orifice Unit No. 18 D

Calibrated by: Rludo. Hauser

Sampler No. HV 2

Date 02-11-85

Indicator No. Dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= 2.21

Correlation coefficient of r = 0.9996

$Q_r =$ M= 0.9872 I

Temp= ~~30~~ 32°F
BP= 603 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r Flow Rate* cmm
1	18		12.1	58.5	56.6
2	13		9.8	52	50.9
3	10		7.5	46	44.5
4	7		4.8	37.5	35.6
5	5		3.0	30	28.1
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble Ranch 1

Orifice Unit No. 18 D

Calibrated by: R. Lamb-Thomas

Sampler No. SSI 2

Date 02-11-85

Indicator No. Dickson
(Rotameter/Recorder)

Q_r = aI ± b b= 3.48

Correlation coefficient of r = 0.9988

Q_r = m= 1.068 I

Temp = 40°F
BP= 603 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18		11.9	62.5	55.7
2	13		9.7	57	50.2
3	10		7.5	51.5	44.2
4	7		4.9	42	35.7
5	5		2.95	32.5	27.7
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 2

Orifice Unit No. 18 D

Calibrated by: P Lawler-Henasior

Sampler No. E10694

Date 02-10-85

Indicator No. Dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= 2.53

Correlation coefficient
of r = 0.9994

Q_r = m= 0.971 I

Temp: 15°f

BP= 594 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18		12	58	56.9
2	13		9.55	52	50.8
3	10		7.3	45	44.4
4	7		4.7	37	35.6
5	5		2.9	30	28.0
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Bread Springs

Orifice Unit No. 812985

Calibrated by: R Lub-Hoven

Sampler No. BS1

Date 05-24-85

Indicator No. Dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b = −0.8774

Correlation coefficient of r = 0.9999

Q_r = M = 1.1296 I

Temp = 21°C

BP = 585 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r SCFM Flow Rate* cmm
1	18		10.7	54	48.69
2	13		8.7	49	43.96
3	10		6.8	43	38.92
4	7		4.5	35	31.76
5	5		2.9	28	25.57
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location: Ft Wingate

Orifice Unit No. 812198S

Calibrated by: RLuke - Heru

Sampler No. TSP 1

Date 05-23-85

Indicator No. rotameter (Rotameter/Recorder)

$Q_r = aI \pm b$ b= −9.742

Correlation coefficient of r = 0.9991

Q_r = m= 1.208 I

Temp= 22°C

BP= 584 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18		7.4	39	40.49
2	None		10.15	48	47.32
3	13		5.8	33	35.90
4	10		4.6	28.5	32.02
5	7		3.0	22	25.94
6	5		1.9	15.5	20.70
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location ft Wingate

Orifice Unit No. 8121985 Calibrated by: [illegible]

Sampler No. TSP 2 . Date 05-23-85

Indicator No. rotameter (Rotameter/Recorder) Q_r = aI ± b b= -10.08

Correlation coefficient of r = 0.9922 Q_r = b= 1.125 I

Temp = 22°C

BP= 584 mm Hg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left Right	Total	I Indicator Reading	Q_r SCFM Flow Rate* cmm
1	18		9.5	41.5	45.80
2	None		13.05	52	53.56
3	13		7.7	35	41.29
4	10		5.9	29.5	36.21
5	7		3.85	23	29.33
6	5		2.3	17	22.75
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location: Ft Wingate

Orifice Unit No. 8121985

Calibrated by: R Lab-Therun

Sampler No. SST

Date 05-23-85

Indicator No. Dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= -1.041

Correlation coefficient of r = 0.9994

Q_r = M= 1.211 I

Temp= 22°C

BP= 584 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18	———	11.0	58.5	49.23
2	13	———	9.15	53	44.96
3	10	———	7.2	48	39.94
4	7	———	4.7	38	32.36
5	5	———	2.95	30	25.72
6		———			
7		———			
Dup-1		———			
Dup-2		———			
		———			

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 1

Orifice Unit No. 8121985

Calibrated by: R Lucle-Hewu

Sampler No. HU 1

Date 05-22-85

Indicator No. Dickson
(Rotameter/Recorder)

Q_r = aI ± b b= 0.8390

Correlation coefficient
of r = 0.9993

Q_r = M= 1.113 I

Temp = 22°C

BP = 594 mm Hg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r SCFM Flow Rate* cmm
1	18		12.3	59	52.46
2	13		10.1	54.5	47.60
3	10		7.8	47	41.91
4	7		5.2	39	34.31
5	5		3.2	31	27.00
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location: Hubble 1

Orifice Unit No.: 812198S

Calibrated by: R Luke-Hewing

Sampler No.: HV 2

Date: 05-22-85

Indicator No. (Rotameter/Recorder): Dickson

$Q_r = aI \pm b$ b= −0.637

Correlation coefficient of r = 0.99981

Q_r = M= 1.105 I

Temp = 22°C

BP= 594 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left Right	Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18	—	12.5	57.5	52.46
2	13	—	10.1	52	47.60
3	10	—	7.8	45.5	41.91
4	7	—	5.2	37	34.31
5	5	—	3.1	29	26.58
6		—			
7		—			
Dup-1		—			
Dup-2		—			
		—			

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 1

Orifice Unit No. 8121985

Calibrated by: R Laulo-Hewn

Sampler No. SSI 2

Date 05-22-86

Indicator No. Dickson
(Rotameter/Recorder)

Q_r = aI ± b b= 1.252

Correlation coefficient of r = 0.9979

Q_r = m=1.1008 I

Temp= 18°C

BP= 594 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r SCfm Flow Rate* cmm
1	18	——	11.7	58	51.54
2	13	——	9.7	53	46.98
3	10	——	7.7	48	41.93
4	7	——	5.45	39	35.36
5	5	——	3.05	31	26.55
6		——			
7		——			
Dup-1		——			
Dup-2		——			
		——			

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 2

Orifice Unit No. 8121985 Calibrated by: R. Lanler Alenon

Sampler No. E10694 . Date 05-22-85

Indicator No. Dickson Q_r = aI ± b b = -7.134
(Rotameter/Recorder)

Correlation coefficient Q_r = m = 1.092 I
of r = 0.9997

Temp: 16°C

BP = 592 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18		12.8	52	53.97
2	13		10.3	45.5	48.48
3	10		7.8	39	42.27
4	7		5.2	31	34.61
5	5		3.1	22	26.81
6					
7					
Dup-1					
Dup-2					

Unadjusted calibration after Dickson replacement; before servicing sampler

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 2

Orifice Unit No. 812198 5 Calibrated by: RLuelo-Herwire

Sampler No. E10694 Date 05-22-85

Indicator No. Dickson Q_r = aI ± b b= 0.0698
(Rotameter/Recorder)
Correlation coefficient of r = 0.9993 Q_r = m= 0.9806 I

Temp = 20 °C
BP = 592

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left Right	Total	I Indicator Reading	Q_r - scfm Flow Rate* cmm
1	18		12.5	52	52.76
2	13		10.2	47	47.92
3	10		7.9	41	42.24
4	7		5.1	34	34.04
5	5		3.1	26	26.63
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Bread Springs

Orifice Unit No. 812A85 Calibrated by: [illegible]

Sampler No. BS1 . Date 09-06-85

Indicator No. Dickson
(Rotameter/Recorder) Q_r = aI ± b b= 0.0971

Correlation coefficient of r = 0.9998 Q_r = M= 1.0632 I

Temp= 25°C

BP= 585 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left Right	Total	I Indicator Reading	Q_r SCFM Flow Rate* cmm
1	18		10.6	51	48.14
2	13		8.6	46.5	43.42
3	10		6.7	41	38.39
4	7		4.3	33	30.85
5	5		2.7	26	24.52
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location ft Wingate

Orifice Unit No. 812198S

Calibrated by: [illegible]

Sampler No. TSP 1

Date 09-06-85

Indicator No. rotameter
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= -11.285

Correlation coefficient of r = 0.9979

Q_r = m= 1.296 I

Temp= 20°C

BP= 585 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	None		10.8	53	~~48~~ 49.00
2	18		8.1	44	42.51
3	13		6.4	37	37.85
4	10		5.0	31	33.51
5	7		3.3	24	27.30
6	5		2.1	18	21.84
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location: Ft Wingate

Orifice Unit No. 812198S

Calibrated by: R Lulo-Abum

Sampler No. TSP 2

Date 09-06-85

Indicator No. rotameter
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= -12.94

Correlation coefficient of r = 0.9932

Q_r = b= 1.195 I

Temp= 20°C

BP= 585 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	Total	I Indicator Reading	Q_r - SCfm Flow Rate* cmm
1	None		14.0	55	55.69
2	18		10.1	43	47.40
3	13		8.0	36	42.25
4	10		6.1	30.5	36.96
5	7		39	24	29.64
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location ft Wingate

Orifice Unit No. 812985

Calibrated by: R Laubenfleur

Sampler No. SST

Date 09-06-85

Indicator No. dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= 3.977

Correlation coefficient of r = 0.9998

$Q_r =$ M= 1.0385 I

Temp = 20 °C

BP = 585 mm Hg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r - SCFM Flow Rate* cmm
1	18		11.4	56	50.32
2	13		9.3	51.5	45.51
3	10		7.3	46	40.39
4	7		4.8	38	32.84
5	5		3.0	31	26.05
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location: Hubble 1

Orifice Unit No. 8121985

Calibrated by: R. [illegible]

Sampler No. HV1

Date 09-06-85

Indicator No. Dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= 1.431

Correlation coefficient of r = 0.9989

Q_r = m= 1.046 I

Temp= 20 °C
BP= 590 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r SCFM Flow Rate* cmm
1	18		12.8	58	53.51
2	13		10.5	51.5	48.53
3	10		8.0	46	42.43
4	7		5.2	37	34.31
5	5		3.2	30	27.00
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 1

Orifice Unit No. 812198 S

Calibrated by: R. [illegible]

Sampler No. HV 2

Date 09-06-85

Indicator No. Dickson (Rotameter/Recorder)

Q_r = aI ± b b = -0.26

Correlation coefficient of r = 0.9987

Q_r = ~~[illegible]~~ 1.102 I

Temp = 20°C

BP = 590 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r SCfm Flow Rate* ~~cmm~~
1	18		11.9	57.0	51.62
2	13		9.9	52.0	47.14
3	10		7.8	45.0	41.91
4	7		5.1	37.0	33.98
5	5		3.0	29.0	26.16
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 1

Orifice Unit No. 812198S Calibrated by: R Lulo-Hen

Sampler No. SST 2 . Date 09-06-85

Indicator No. Dickson
(Rotameter/Recorder) Q_r = aI ± b b= 2.576

Correlation coefficient
of r = 0.9998 Q_r = M=1.0713 I

Temp = 20°C

BP = 590 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r Flow Rate* ~~cmm~~ SCFM
1	18		11.9	57.5	51.18
2	13		9.7	52	46.27
3	10		7.7	47	41.29
4	7		5.0	38	33.37
5	5		3.1	31	26.36
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 2

Orifice Unit No. 8121985

Calibrated by: [illegible signature]

Sampler No. E10694

Date 09-06-85

Indicator No. Dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b = -0.633

Correlation coefficient of r = 0.9995

Q_r = M= 1.0048 I

Temp: 25°C

BP= 590 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left/Right	ΔH Total	I Indicator Reading	Q_r Flow Rate* SCFM cmm
1	18	—	12.4	52	52.23
2	13	—	9.9	46.5	46.71
3	10	—	7.6	40	41.02
4	7	—	5.0	33	33.27
5	5	—	3.0	25.5	25.94
6		—			
7		—			
Dup-1		—			
Dup-2		—			
		—			

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location: Bread Springs

Orifice Unit No. 8121985

Calibrated by: R Lale-Thomas

Sampler No. BS1

Date 12-11-85

Indicator No. Dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= 1.017

Correlation coefficient of r = 0.9992

Q_r = m= 1.004 I

Temp= -4°C

Bp= 582 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left/Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r scfm Flow Rate* cmm
1	18	—	8.0	45	43.99
2	13	—	6.2	40	38.79
3	~~10~~ 5	—	2.6	26	25.27
4	7	—	3.55	31	29.46
5	~~8~~ 10	—	4.95	36	34.71
6		—			
7		—			
Dup-1		—			
Dup-2		—			
		—			

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Ft Wingate

Orifice Unit No. 8121985 Calibrated by: R Lu[illegible]

Sampler No. TSP1 Date 12-11-85

Indicator No. rotameter (Rotameter/Recorder) Q_r = aI ± b b= -9.512

Correlation coefficient of r = 0.9992 Q_r = M= 1.1085 I

Temp= -1 °C

BP= 581 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	Total	I Indicator Reading	Q_r SCfm Flow Rate* cmm
1	18	—	7.9	39	43.43
2	~~10~~ 13	—	6.8	35	40.34
3	10	—	5.4	30	36.02
4	7	—	4.0	25	31.05
5	5	—	2.9	20	26.49
6		—			
7		—			
Dup-1		—			
Dup-2		—			
		—			

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location ft Wingate

Orifice Unit No. 8121985 Calibrated by: R Lab. Hem

Sampler No. TSP 2 Date 12-11-85

Indicator No. rotameter Q_r = aI ± b b= -7.859
(Rotameter/Recorder)

Correlation coefficient of r = 0.9961 Q_r = M= 0.9126 I

Temp = -1°C

BP= 581 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r Flow Rate* cmm
1	18		8.1	33	43.97
2	13		7.4	30	42.06
3	10		5.7	25	36.98
4	7		3.75	20	30.07
5	5		3.2	17.5	27.81
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location ft Wingate

Orifice Unit No. 8121985 Calibrated by: R Lubitham

Sampler No. SST Date 12-11-85

Indicator No. Dickson $Q_r = aI \pm b$ b= -1.568
(Rotameter/Recorder)

Correlation coefficient of r = 0.9996 Q_r = M=1.112 I

Temp= -1 °C

BP= 581 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left Right	Total	I Indicator Reading	Q_r Flow Rate* cmm scfm
1	18		7.6	46	42.61
2	10		5.85	40	37.45
3	7		4.55	35	33.09
4	5		3.3	30	28.24
5	13		6.75	43	40.19
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 1

Orifice Unit No. 812198S

Calibrated by: Rluke-Hem

Sampler No. HV1 .

Date 12-12-85

Indicator No. Dickson
(Rotameter/Recorder)

Q_r = aI ± b b= 0.405

Correlation coefficient of r = 0.9989

Q_r = m= 1.005 I

Temp= −2°C

BP= 595 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	Total	I Indicator Reading	Q_r SCfm Flow Rate* cmm
1	18		8.5	46	45.66
2	10		7.0	42.5	41.48
3	7		4.5	34	33.36
4	5		4.3	33	32.62
5	13		7.3	43	42.35
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 1

Orifice Unit No. 8121985 Calibrated by: Rlule-Hem

Sampler No. HU2 Date 12-12-85

Indicator No. Dickson Q_r = aI ± b b = -1,244
(Rotameter/Recorder)

Correlation coefficient of r = 0,9985 Q_r = M= 1,071 I

Temp = -2°C

BP= 595 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left/Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r SCFM Flow Rate* cmm
1	10		5,9	40	38,13
2	7		4,5	34	33,36
3	5		34	30	29,05
4	18		8,0	46	44,31
5	13		6,6	42	40,30
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location Hubble 1

Orifice Unit No. 8121985

Calibrated by: R Lab. [illegible]

Sampler No. SSI 2

Date 12-12-85

Indicator No. Dickson
(Rotameter/Recorder)

Q_r = aI ± b b= 2.189

Correlation coefficient of r = 0.9996

Q_r = m= 1.0349 I

Temp= -2°C

BP= 595 mmHg

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r SCFM Flow Rate* cmm
1	18		7.6	47.5	43.76
2	13		6.6	44	40.30
3	7		4.8	38	34.44
4	5		2.9	30	26.86
5	10		5.5	40	36.83
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

HI VOL SAMPLER CALIBRATION DATA SHEET

Sampler Location: Hubble 2

Orifice Unit No.: 812198S

Calibrated by: R [illegible]

Sampler No.: E10694

Date: 12-12-85

Indicator No.: Dickson
(Rotameter/Recorder)

$Q_r = aI \pm b$ b= 2.039

Correlation coefficient of r = 0.9994

$Q_r =$ 1.023 I

Temp = −4°C

BP= 595

Run Number	Voltage or Plate Number	ΔH Manometer in. Water Left / Right	ΔH Manometer in. Water Total	I Indicator Reading	Q_r - SCFM Flow Rate* cmm
1	10		5.5	39.5	36.97
2	13		6.8	44	41.05
3	18		8.1	48	44.75
4	7		4.1	35	31.98
5	5		3.2	31	28.30
6					
7					
Dup-1					
Dup-2					

*Flow rate from orifice unit calibration chart or equation.

APPENDIX B

OPERATING PROCEDURES FOR ATMOSPHERIC PARTICULATE SAMPLERS

The following are written instructions as they were provided to the local site operators to help them in servicing the particulate samplers. These instructions were adapted from the "Inhalable Particulate Network Operations and Quality Assurance Manual" (US EPA March 1983).

2.3 OPERATING PROCEDURES FOR THE CONVENTIONAL HIGH VOLUME SAMPLER

2.3.1 Introduction

This section presents operating procedures for the conventional high volume sampler. In large part, these operating procedures were taken from procedures published by Rockwell International.[1] Where appropriate, they have been modified and expanded to conform to current IP Network practices.

2.3.2 Description of the High Volume Sampler

2.3.2.1 General--

The total suspended particulate (TSP) high volume sampler (General Metals model 2310-105 or equivalent) used in the IP Network is equipped with a mass flow controller, electromechanical elapsed timers, and a flow recording device (see Figure 2.3.1.) as required by the official reference method for high volume TSP sampling.[2] The nominal operating flow rate is 1.42 m^3/min (50 ft^3/min).

The sampler consists of a blower unit to which a filter holder is attached. The filter holder consists of two parts: (1) a stainless steel filter adapter, which forms an 8-in. × 10-in. rectangular opening at the top covered with a coarse stainless steel screen and which ends in a circular screw-on connector at the bottom; and (2) an open rectangular face plate of cast iron or aluminum with a sponge rubber gasket. In sampling, a filter is placed between the filter support screen and the gasketed face plate. The adapter screws onto the blower unit using a circular rubber gasket to make an airtight seal. The sampler is identified by serial number that should be used in reporting samples collected. The sampler is designed to operate with the filter in a horizontal position. A standard shelter is provided for protection. The sampler operates at 110 V a.c. and requires approximately 7 A (550 W). A three-conductor extension cord of at least 16-gauge wire should be used to connect the sampler to the power source.

2.3.2.2 Flow System Description--

Flow rate measurement is obtained by using a Dickson Mini-corder, which is permanently installed on the front of the sampler shelter (Figure 2.3.1). This recorder provides continuous flow rate readings and is attached to the

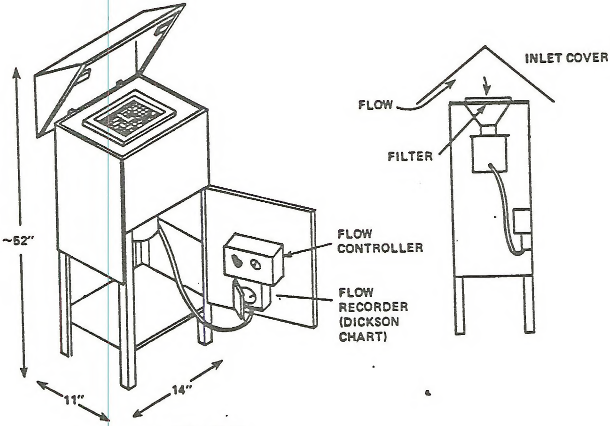

Figure 2.3.1. TSP high volume sampler used in IP Network.

blower housing via a section of Tygon® tubing. The recorder runs continuously, independently of the sampler. On startup, the pen rises from zero to indicate the actual flow rate and the start time. The end of the sampling period is marked on the Dickson chart by a drop in flow rate to zero. Thus, the Dickson chart will record the start time, stop time, and any power interruptions as well as the flow rate during the operating period. Figure 2.3.2 gives three examples of Dickson chart recordings.

Under normal conditions with a clean filter in place, the Dickson recorder should read in the range of 1.42 m^3/min (50 stdft^3/min) for TSP monitoring. In some instances, due to low operating voltage, worn motor, etc., the reading may be somewhat lower. Flow rate readings outside the range of 1.42 m^3/min ±10 percent are more often due to malfunction of the Dickson recorder than to malfunction of the sampler. Particulate levels are very seldom high enough to cause the flow rate to drop more than 10 percent.

If the filter becomes wet during a severe storm, the motor may overheat sufficiently to damage it beyond repair. Therefore, whenever possible, the unit should be shut off during storms.

2.3.2.3 Control System Description--

2.3.2.3.1 Time measurement--The total sampling time is measured with an ordinary electromechanical time meter located on the face of the flow controller. It is turned on and off simultaneously with the sampler by the master timer. It measures the time in minutes and can be reset by pushing a button to return all counters to zero.

2.3.2.3.2 Master timer--Timed operation of the conventional high volume sampler is controlled by a master timer. The operator need not be concerned with the master timer except during a calibration or calibration check, or if a power outage occurs during the sampling period (see Section 2.3.6.3). However, the operator should check the master timer at each sample change to make sure that the next sampling period will be correct.

* make certain that timer and dickson chart are time synchronized and correct

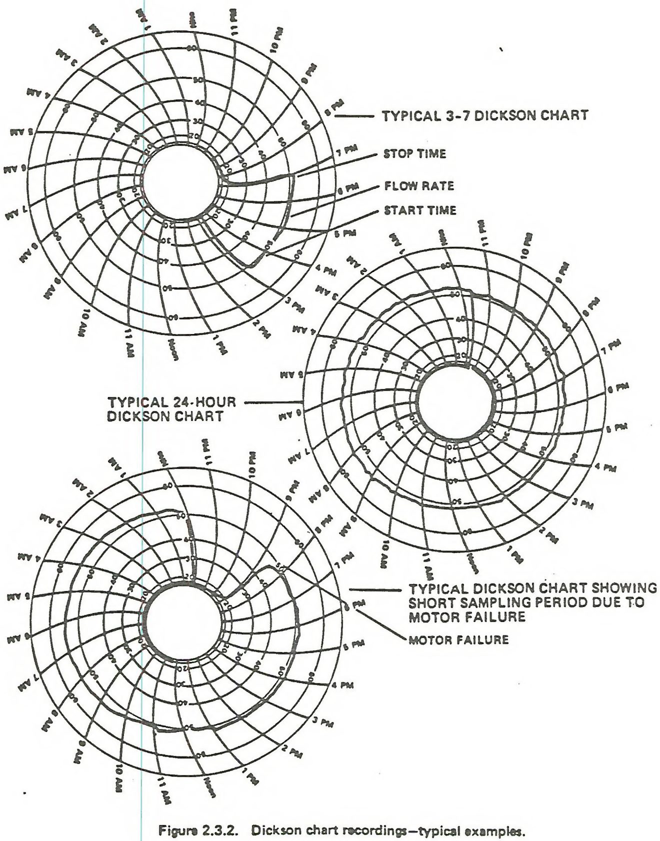

Figure 2.3.2. Dickson chart recordings—typical examples.

2.3.3 Operation of the Conventional High Volume Sampler

2.3.3.1 Filter Handling--

Glass fiber filters purchased by EPA for all 1979-83 network sampling are currently used for IP Network high volume sampling. Although these filters are reasonably strong, they should be handled very carefully. Each filter must remain intact so that it can be weighed before and after sampling in the laboratory. Therefore, use only the edges of the filter to remove it from the sampler and fold it. Above all, do not contaminate the filter by handling it with dirty fingers. Damaged filters should not be used for sampling.

2.3.3.2 Operation Procedures--

1. Open the roof of the shelter. Unscrew the four wing nuts holding the face plate until the bolts can be pushed back sufficiently to permit the removal of the plate. Remove the face plate by lifting it up carefully.

2. Using the corner of the filter folder, carefully lift the filter from the holder. Slide the folder under the filter, center it, and fold carefully, lengthwise, at the center of the exposed area. When folded, only exposed areas should contact exposed areas.

   Examination of the filter at the end of a sampling period will show if the filter was properly placed and sealed. The edges of the sample area should be sharply defined with a ½-inch clean margin on every side.

3. Place the folder containing the filter in the brown folder provided as shown in Figure 2.3.3.

4. Remove the Dickson chart and place it and the filter in the envelope provided. Be sure that the sample type (TSP), filter number, date, site number, and average Dickson reading are recorded on the back of the Dickson chart. (date of sample run)

5. Note the total elapsed time in minutes.

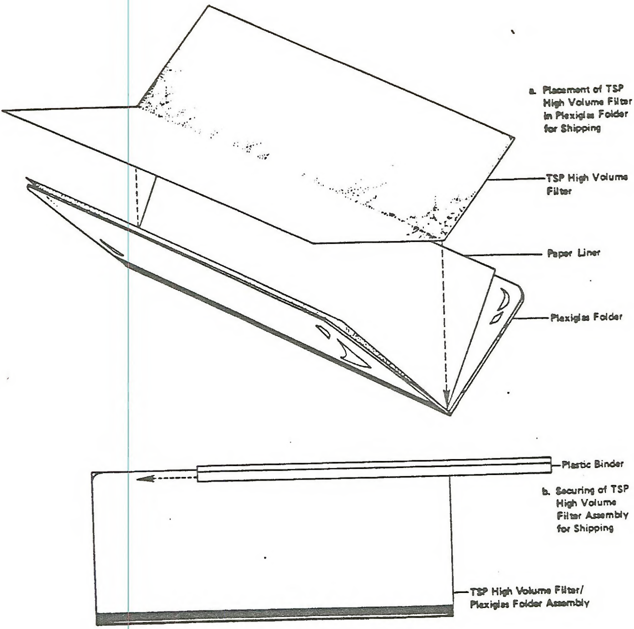

Figure 2.3.3. TSP high volume filter shipping assembly.

6. Reset the mechanical time meter.

7. Check the electronic timer for proper time synchronization.

8. Record the field data on the data sheet and in the daily logbook.

9. Place a clean filter in position on the screen of the filter holder. If the screen appears dirty, it should be wiped off with a clean Kimwipe® paper towel. If the filter has a smooth and a rough side, the smooth side should be placed down. Be sure the filter is centered on the screen so that when the face plate is in position, the gasket will make an airtight seal on the outer edges of the filter.

10. Place the plate in position on the filter holder, being careful not to move the filter out of position. Move the bolts into place and gently tighten the wing nuts, working from opposite corners. The plate is tightened properly about one turn after the nut contacts the face plate. <u>It is important that the wing nuts be tightened evenly and properly to prevent air leakage around the filter. If they are too tight, the gasket becomes flattened and will not recover its elasticity sufficiently to seal properly. If the face plate has not been sufficiently tightened, the edges of the sample area will be irregular and signs of air leakage will be shown by streaks across the clean margins.</u> Close the roof of the shelter carefully to avoid damaging the filter.

11. Install a new chart (No. 106 Dickson) on the Dickson recorder. Record the sample type (TSP), site, filter number, and sampling date on the back of the chart before installation. Place the chart on the recorder. Care should be taken to ensure that the edges are properly located under the two small retainers and that the center drive spindle is inserted properly.

12. Check to see that the chart is set at the proper starting position. To advance the chart to the correct starting time, insert a coin in the slotted drive spindle and turn it clockwise to the required time.

13. Zero the pen by gently tapping the side of the recorder and adjusting the zero potentiometer, if necessary.

14. Record the Dickson information in the daily logbook on the appropriate data sheet.

2.3.3.3 Miscellaneous--

Under adverse weather conditions, precautions must be taken to avoid damage to the filter. During periods of high wind or heavy precipitation, it may be necessary to turn off the sampler and postpone removal of the filter until weather conditions improve.

Sometimes the filter adheres to the gasket when the face plate is removed. When this occurs, the filter may be dislodged by gently tapping the face plate. Dusting the gasket with talc before installing new filters and exercising caution against excessive tightening of the wing nuts help to minimize the tendency of the filter to stick to the gasket. Excess talc should be removed from the gasket by wiping with a clean Kimwipe® paper towel.

2.3.4 <u>Recording the Field Data</u>

The site operator is responsible for keeping records pertaining to sample identification and sampler operation. Sampling information <u>must</u> be recorded on standard format data sheets as shown in Figure 2.3.4. A new data sheet should be used whenever the sampler rotameter setpoint is changed. Return data sheets <u>monthly</u> to: Ron Keavner PEI Associates, 14062 Denver West Parkway # 215, Golden CO 80401

Each exposed filter sample should be packaged for shipping in a brown folder as shown in Figure 2.3.3. Place this assembly in a separate envelope <u>with</u> the dickson chart completed from information on the data sheets, including note of any unusual or adverse weather conditions (e.g., high winds, rain, or dust from nearby construction) that may affect the sample validity. Return <u>promptly</u> to PEI Associates, Golden CO

APPENDIX C

METEOROLOGICAL SYSTEM CHECKLIST

The following is a checklist used by the site operator to determine the operational status of the meteorological parameter recording systems. Operation checks were performed during each site visit and data sheets were forwarded to the PEI field project manager every month. These data sheets were then used as supplemental information during the review of stripchart data.

SITE:

Date:						
RECORDER CHECKS Pens inking clearly	Y/N					
Chart supply adequate	Y/N					
Date & time marked	Y/N					
WIND SPEED/DIRECTION Wind arm alligned	Y/N					
3 cups on wind speed	Y/N					
cups move freely	Y/N					
wind direction accurate	Y/N					
vane moves freely	Y/N					
PRECIPITATION CHECKS Bucket clean	Y/N					
RESET	Y/N					
heater working	Y/N					
TEMPERATURE CHECKS Chart temp reading	°F					
Thermometer reading	°F					
SYSTEM CHECKS Power light ON (white)	Y/N					
Zero/span lights (red)	OK/NOK					
CHART READINGS						

ZERO	Wind Speed						
	Precipitation						
	Wind Direction						
	Temperature						
SPAN	Wind Speed						
	Precipitation						
	Wind Direction						
	Temperature						

APPENDIX D

PARTICULATE SAMPLER CONCENTRATION DATA FOR TSP AND PM_{10} SAMPLERS

This appendix contains the summarized Multiplan spreadsheet printouts which present sampler site, sample date, and particulate concentration as specified in SAROAD format. Particulate concentrations for all validated samples are contained in this section. Data are presented and summarized for each calendar quarter for each sampler.

Where locations are given on data sheets as Hubbell 1 and Hubbell 2, these are the same as Quemado 1 and Quemado 2.

SITE: BREADSCH
SAMPLER: BS1

DATE	CONC UG/M3
02-12-85	12.92
02-18-85	17.24
02-24-85	10.04
03-02-85	24.42
03-08-85	26.31
03-14-85	9.09
03-20-85	12.72
03-26-85	48.45

'N'	8
ARITH.MEAN	20.15
STD.DEV	13.08
GEOM.MEAN	17.31
SGD	1.76

SITE: BREADSCH
SAMPLER: BS1

DATE	CONC UG/M3
04-01-85	16.36
04-07-85	30.11
04-13-85	40.92
04-19-85	24.71
04-25-85	61.33
05-01-85	23.39
05-07-85	45.24
05-13-85	46.72
05-19-85	27.41
05-25-85	48.89
05-31-85	34.90
06-06-85	*
06-12-85	88.40
06-18-85	53.91
06-24-85	40.25
06-30-85	70.61

* FILTER RAN TWICE

'N'	15
ARITH.MEAN	43.54
STD.DEV	19.35
GEOM.MEAN	39.69
SGD	1.57

SITE: BREADSCH
SAMPLER: BS1

DATE	CONC UG/M3
07-06-85	67.95
07-12-85	33.71
07-18-85	21.40
07-24-85	26.83
07-30-85	13.37
08-05-85	29.03
08-11-85	25.35
08-17-85	51.99
08-23-85	53.25
08-29-85	55.77
09-04-85	34.94
09-10-85	41.54
09-16-85	43.01
09-22-85	36.56
09-28-85	11.24

'N'	15
ARITH.MEAN	36.40
STD.DEV	16.11
GEOM.MEAN	32.66
SGD	1.67

SITE: BREADSCH
SAMPLER: BS1

DATE	CONC UG/M3
10-04-85	45.90
10-10-85	70.20
10-16-85	13.51
10-22-85	25.06
10-28-85	26.93
11-03-85	27.54
11-09-85	87.71
11-15-85	17.16
11-21-85	11.27
11-27-85	11.04
12-03-85	21.29
12-09-85	23.68
12-15-85	14.60
12-21-85	26.03
12-27-85	18.99

'N'	15
ARITH.MEAN	29.40
STD.DEV	22.15
GEOM.MEAN	24.14
SGD	1.84

SITE: BREADSCH
SAMPLER: BS1

DATE	CONC UG/M3
01-02-86	12.41
01-08-86	21.25
01-14-86	51.58
01-20-86	32.78
01-26-86	64.08
02-01-86	16.55
02-07-86	12.26
02-13-86	10.80

'N'	8
ARITH.MEAN	27.71
STD.DEV	20.15
GEOM.MEAN	22.36
SGD	1.98

SITE: HUBBELL 1
SAMPLER: HV1

DATE	CONC UG/M3
02-12-85	3.47
02-18-85	9.59
02-24-85	8.75
03-02-85	17.45
03-08-85	46.49
03-14-85	14.82
03-20-85	13.66
03-26-85	18.95

'N'	8
ARITH.MEAN	16.65
STD.DEV	13.06
GEOM.MEAN	13.17
SGD	2.10

SITE: HUBBELL 1
SAMPLER: HV1

DATE	CONC UG/M3
04-01-85	13.05
04-07-85	14.41
04-13-85	19.09
04-19-85	18.92
04-25-85	35.08
05-01-85	11.60
05-07-85	23.79
05-13-85	16.83
05-19-85	19.74
05-25-85	30.87
05-31-85	22.99
06-06-85	19.75
06-12-85	33.74
06-18-85	48.90
06-24-85	46.31
06-30-85	52.23

'N'	16
ARITH.MEAN	26.71
STD.DEV	13.08
GEOM.MEAN	24.01
SGD	1.60

SITE: HUBBELL 1
SAMPLER: HV1

DATE	CONC UG/M3
07-06-85	60.27
07-12-85	46.75
07-18-85	24.84
07-24-85	34.36
07-30-85	17.98
08-05-85	23.70
08-11-85	31.38
08-17-85	36.59
08-23-85	31.23
08-29-85	29.28
09-04-85	*
09-10-85	20.34
09-16-85	15.16
09-22-85	12.27
09-28-85	6.32

* FILTER RAN TWICE

'N'	14
ARITH.MEAN	27.89
STD.DEV	14.14
GEOM.MEAN	24.35
SGD	1.78

SITE: HUBBELL 1
SAMPLER: HV1

DATE	CONC UG/M3
10-04-85	34.77
10-10-85	6.80
10-16-85	8.30
10-22-85	13.46
10-28-85	10.03
11-03-85	12.14
11-09-85	33.06
11-15-85	8.03
11-21-85	19.99
11-27-85	14.50
12-03-85	10.28
12-09-85	15.14
12-15-85	10.42
12-21-85	9.81
12-27-85	9.98

'N'	15
ARITH.MEAN	14.45
STD.DEV	8.57
GEOM.MEAN	12.77
SGD	1.62

SITE: HUBBELL 1
SAMPLER: HV1

DATE	CONC UG/M3
01-02-86	3.22
01-08-86	4.17
01-14-86	8.27
01-20-86	9.71
01-26-86	10.09
02-01-86	5.38
02-07-86	6.34
02-13-86	3.19

'N'	8
ARITH.MEAN	6.30
STD.DEV	2.79
GEOM.MEAN	5.74
SGD	1.59

SITE: HUBBELL 1
SAMPLER: HV2

DATE	CONC UG/M3
02-12-85	3.60
02-18-85	9.26
02-24-85	7.85
03-02-85	17.29
03-08-85	44.49
03-14-85	12.90
03-20-85	9.37
03-26-85	17.08

'N'	8
ARITH.MEAN	15.23
STD.DEV.	12.70
GEOM.MEAN	11.95
SGD	2.08

SITE: HUBBELL 1
SAMPLER: HV2

DATE	CONC UG/M3
04-01-85	10.30
04-07-85	12.82
04-13-85	17.77
04-19-85	17.75
04-25-85	34.44
05-01-85	14.80
05-07-85	18.78
05-13-85	13.62
05-19-85	16.41
05-25-85	29.87
05-31-85	24.66
06-06-85	19.25
06-12-85	32.33
06-18-85	42.69
06-24-85	40.01
06-30-85	48.62

'N'	16
ARITH.MEAN	24.63
STD.DEV	11.86
GEOM.MEAN	22.16
SGD	1.60

SITE: HUBBELL 1
SAMPLER: HV2

DATE	CONC UG/M3
07-06-85	50.37
07-12-85	45.62
07-18-85	20.47
07-24-85	25.19
07-30-85	13.84
08-05-85	19.08
08-11-85	22.43
08-17-85	31.52
08-23-85	24.06
08-29-85	37.19
09-04-85	**
09-10-85	7.30
09-16-85	6.15
09-22-85	9.62
09-28-85	6.45

** FILTER DIDN'T RUN

'N'	14
ARITH.MEAN	22.81
STD.DEV	14.22
GEOM.MEAN	18.50
SGD	2.03

SITE: HUBBELL 1
SAMPLER: HV2

DATE	CONC UG/M3
10-04-85	29.67
10-10-85	6.57
10-16-85	5.37
10-22-85	9.31
10-28-85	10.77
11-03-85	11.25
11-09-85	34.39
11-15-85	7.33
11-21-85	18.69
11-27-85	13.72
12-03-85	9.76
12-09-85	13.88
12-15-85	7.50
12-21-85	9.71
12-27-85	4.91

'N'	15
ARITH.MEAN	12.86
STD.DEV	8.61
GEOM.MEAN	10.91
SGD	1.76

SITE: HUBBELL 1
SAMPLER: HV2

DATE	CONC UG/M3
01-02-86	3.41
01-08-86	5.20
01-14-86	14.75
01-20-86	8.73
01-26-86	11.17
02-01-86	31.00
02-07-86	7.22
02-13-86	3.81

'N'	8
ARITH.MEAN	10.66
STD.DEV	9.07
GEOM.MEAN	8.27
SGD	2.09

SITE: HUBBELL 1
SAMPLER: SSI2

DATE	CONC UG/M3
02-12-85	3.22
02-18-85	#
02-24-85	4.14
03-02-85	4.07
03-08-85	23.45
03-14-85	7.70
03-20-85	7.88
03-26-85	12.34

FLOW RATE MALFUNC.

'N'	7
ARITH.MEAN	8.97
STD.DEV	7.12
GEOM.MEAN	7.15
SGD	2.02

SITE: HUBBELL 1
SAMPLER: SSI2

DATE	CONC UG/M3
04-01-85	9.80
04-07-85	7.55
04-13-85	10.30
04-19-85	11.29
04-25-85	15.37
05-01-85	7.28
05-07-85	10.94
05-13-85	8.24
05-19-85	8.25
05-25-85	15.89
05-31-85	12.18
06-06-85	12.63
06-12-85	19.09
06-18-85	23.59
06-24-85	27.64
06-30-85	30.93

'N'	16
ARITH.MEAN	14.44
STD.DEV	7.30
GEOM.MEAN	13.01
SGD	1.58

SITE: HUBBELL 1
SAMPLER: SSI2

DATE	CONC UG/M3
07-06-85	25.07
07-12-85	25.81
07-18-85	6.58
07-24-85	17.33
07-30-85	13.41
08-05-85	16.75
08-11-85	11.93
08-17-85	14.07
08-23-85	13.13
08-29-85	***
09-04-85	**
09-10-85	#
09-16-85	#
09-22-85	6.12
09-28-85	4.82

FLOW RATE MALFUNC.
** FILTER DIDN'T RUN
*** CHART MALFUNCTION

'N'	11
ARITH.MEAN	14.09
STD.DEV	6.98
GEOM.MEAN	12.41
SGD	1.74

SITE: HUBBELL 1
SAMPLER: SSI2

DATE	CONC UG/M3
10-04-85	12.40
10-10-85	3.85
10-16-85	5.15
10-22-85	10.87
10-28-85	***
11-03-85	9.36
11-09-85	13.87
11-15-85	6.93
11-21-85	12.34
11-27-85	9.47
12-03-85	8.18
12-09-85	10.01
12-15-85	6.44
12-21-85	6.41
12-27-85	***

*** CHART MALFUNCTION

'N'	13
ARITH.MEAN	8.87
STD.DEV	3.04
GEOM.MEAN	8.34
SGD	1.46

SITE: HUBBELL 1
SAMPLER: SSI2

DATE	CONC UG/M3
01-02-86	1.54
01-08-86	2.29
01-14-86	3.73
01-20-86	4.22
01-26-86	***
02-01-86	2.54
02-07-86	#
02-13-86	1.93

FLOW RATE MALFUNC.
*** CHART MALFUNCTION

'N'	6
ARITH.MEAN	2.71
STD.DEV	1.05
GEOM.MEAN	2.55
SGD	1.47

SITE: HUBBELL 2
SAMPLER: E10694

DATE	CONC UG/M3
02-12-85	0.76
02-18-85	7.80
02-24-85	4.63
03-02-85	14.63
03-08-85	30.49
03-14-85	12.12
03-20-85	10.41
03-26-85	18.82

'N'	8
ARITH.MEAN	12.46
STD.DEV	9.21
GEOM.MEAN	8.57
SGD	3.10

SITE: HUBBELL 2
SAMPLER: E10694

DATE	CONC UG/M3
04-01-85	9.48
04-07-85	16.51
04-13-85	24.56
04-19-85	15.65
04-25-85	33.90
05-01-85	10.16
05-07-85	20.00
05-13-85	12.97
05-19-85	22.33
05-25-85	32.17
05-31-85	20.27
06-06-85	33.20
06-12-85	32.23
06-18-85	38.75
06-24-85	38.33
06-30-85	50.97

'N'	16
ARITH.MEAN	25.72
STD.DEV	11.84
GEOM.MEAN	23.05
SGD	1.65

SITE: HUBBELL 2
SAMPLER: E10694

DATE	CONC UG/M3
07-06-85	4.89
07-12-85	3.72
07-18-85	2.50
07-24-85	2.73
07-30-85	1.61
08-05-85	2.01
08-11-85	26.67
08-17-85	33.83
08-23-85	22.92
08-29-85	29.41
09-04-85	**
09-10-85	16.35
09-16-85	18.36
09-22-85	9.72
09-28-85	3.50

** FILTER DIDN'T RUN

'N'	14
ARITH.MEAN	12.73
STD.DEV	11.59
GEOM.MEAN	7.68
SGD	3.04

SITE: HUBBELL 2
SAMPLER: E10694

DATE	CONC UG/M3
10-04-85	16.50
10-10-85	7.89
10-16-85	4.10
10-22-85	15.53
10-28-85	11.47
11-03-85	15.92
11-09-85	26.95
11-15-85	7.55
11-21-85	17.62
11-27-85	10.41
12-03-85	10.78
12-09-85	17.41
12-15-85	***
12-21-85	8.67
12-27-85	7.73

*** CHART MALFUNCTION

'N'	14
ARITH.MEAN	12.75
STD.DEV	5.93
GEOM.MEAN	11.50
SGD	1.62

SITE: HUBBELL 2
SAMPLER: E10694

DATE	CONC UG/M3
01-02-86	3.06
01-08-86	4.80
01-14-86	5.29
01-20-86	9.38
01-26-86	5.39
02-01-86	3.49
02-07-86	3.11
02-13-86	***

*** CHART MALFUNCTION

'N'	7
ARITH.MEAN	4.93
STD.DEV	2.20
GEOM.MEAN	4.58
SGD	1.49

SITE: FT.WINGATE
SAMPLER: TSP1

DATE	CONC UG/M3
02-12-85	7.01
02-18-85	12.51
02-24-85	9.71
03-02-85	19.43
03-08-85	17.83
03-14-85	9.15
03-20-85	13.29
03-26-85	28.39

'N'	8
ARITH.MEAN	14.67
STD.DEV	6.98
GEOM.MEAN	13.37
SGD	1.58

SITE: FT.WINGATE
SAMPLER: TSP1

DATE	CONC UG/M3
04-01-85	15.17
04-07-85	14.15
04-13-85	18.31
04-19-85	15.71
04-26-85	*
05-01-85	14.23
05-07-85	29.95
05-13-85	17.13
05-19-85	16.46
05-25-85	25.98
05-31-85	19.13
06-06-85	22.31
06-12-85	20.48
06-18-85	50.08
06-24-85	46.01
06-30-85	33.03

* FILTER RAN TWICE

'N'	15
ARITH.MEAN	23.87
STD.DEV	11.34
GEOM.MEAN	21.90
SGD	1.51

SITE: FT.WINGATE
SAMPLER: TSP1

DATE	CONC UG/M3
07-06-85	36.64
07-12-85	27.98
07-18-85	19.26
07-24-85	13.51
07-31-85	*
08-05-85	18.13
08-11-85	16.49
08-17-85	34.15
08-23-85	28.49
08-29-85	#
09-04-85	15.86
09-10-85	10.16
09-16-85	13.81
09-22-85	6.90
09-28-85	7.06

* FILTER RAN TWICE
\# FLOW RATE MALFUNC.

'N'	13
ARITH.MEAN	19.11
STD.DEV	9.80
GEOM.MEAN	16.79
SGD	1.72

SITE: FT.WINGATE
SAMPLER: TSP1

DATE	CONC UG/M3
10-04-85	23.15
10-10-85	5.73
10-16-85	10.74
10-22-85	11.55
10-28-85	15.10
11-03-85	7.81
11-09-85	46.09
11-15-85	7.55
11-21-85	12.08
11-27-85	5.63
12-03-85	*
12-09-85	12.35
12-15-85	8.33
12-21-85	11.56
12-27-85	8.04

* FILTER RAN TWICE

'N'	28
ARITH.MEAN	13.26
STD.DEV	10.46
GEOM.MEAN	11.11
SGD	1.75

SITE: FT.WINGATE
SAMPLER: TSP1

DATE	CONC UG/M3
01-02-86	2.62
01-08-86	7.94
01-14-86	9.02
01-20-86	14.58
01-26-86	6.00
02-01-86	5.91
02-07-86	4.26
02-13-86	4.32

'N'	8
ARITH.MEAN	6.83
STD.DEV	3.75
GEOM.MEAN	6.05
SGD	1.69

SITE: FT.WINGATE
SAMPLER: TSP2

DATE	CONC UG/M3
02-12-85	6.42
02-18-85	1.21
02-24-85	9.32
03-02-85	20.55
03-08-85	16.19
03-14-85	9.79
03-20-85	13.30
03-26-85	30.12

'N'	8
ARITH.MEAN	13.36
STD.DEV	8.99
GEOM.MEAN	9.93
SGD	2.66

SITE: FT.WINGATE
SAMPLER: TSP2

DATE	CONC UG/M3
04-01-85	15.09
04-07-85	13.88
04-13-85	18.62
04-19-85	15.21
04-26-85	*
05-01-85	13.64
05-07-85	28.81
05-13-85	17.72
05-19-85	16.06
05-25-85	25.91
05-31-85	16.98
06-06-85	22.38
06-12-85	33.12
06-18-85	55.31
06-24-85	47.64
06-30-85	39.69

* FILTER RAN TWICE

'N'	15
ARITH.MEAN	25.34
STD.DEV	13.14
GEOM.MEAN	22.75
SGD	1.59

SITE: FT.WINGATE
SAMPLER: TSP2

DATE	CONC UG/M3
07-06-85	35.74
07-12-85	26.54
07-18-85	16.13
07-24-85	15.84
07-30-85	*
08-05-85	17.76
08-11-85	16.82
08-17-85	34.79
08-23-85	27.59
08-29-85	15.75
09-04-85	15.99
09-10-85	10.51
09-16-85	13.21
09-22-85	10.02
09-28-85	6.37

* FILTER RAN TWICE

'N'	14
ARITH.MEAN	18.79
STD.DEV	8.99
GEOM.MEAN	16.90
SGD	1.62

SITE: FT.WINGATE
SAMPLER: TSP2

DATE	CONC UG/M3
10-04-85	22.06
10-10-85	5.78
10-16-85	9.31
10-22-85	11.49
10-28-85	15.14
11-03-85	7.87
11-09-85	40.58
11-15-85	7.16
11-21-85	10.97
11-27-85	5.25
12-03-85	*
12-09-85	11.29
12-15-85	7.48
12-21-85	10.74
12-27-85	7.42

* FILTER RAN TWICE

'N'	14
ARITH.MEAN	12.32
STD.DEV	9.21
GEOM.MEAN	10.44
SGD	1.72

SITE: FT.WINGATE
SAMPLER: TSP2

DATE	CONC UG/M3
01-02-86	3.55
01-08-86	9.33
01-14-86	12.40
01-20-86	13.89
01-26-86	5.84
02-01-86	6.05
02-07-86	4.24
02-13-86	3.91

'N'	8
ARITH.MEAN	7.40
STD.DEV	4.00
GEOM.MEAN	6.54
SGD	1.69

SITE: FT.WINGATE
SAMPLER: SSI

DATE	CONC UG/M3
02-12-85	4.46
02-18-85	7.05
02-24-85	4.18
03-02-85	9.51
03-08-85	13.65
03-14-85	5.89
03-20-85	8.56
03-26-85	12.43

'N'	8
ARITH.MEAN	8.22
STD.DEV	3.51
GEOM.MEAN	7.56
SGD	1.55

SITE: FT.WINGATE
SAMPLER: SSI

DATE	CONC UG/M3
04-01-85	8.86
04-07-85	7.20
04-13-85	10.91
04-19-85	9.73
04-26-85	*
05-01-85	8.79
05-07-85	13.16
05-13-85	7.10
05-19-85	7.40
05-25-85	13.75
05-31-85	10.86
06-06-85	12.90
06-12-85	18.75
06-18-85	23.58
06-24-85	30.65
06-30-85	23.88

* FILTER RAN TWICE

'N'	15
ARITH.MEAN	13.84
STD.DEV	7.17
GEOM.MEAN	12.42
SGD	1.59

SITE: FT.WINGATE
SAMPLER: SSI

DATE	CONC UG/M3
07-06-85	22.42
07-12-85	17.23
07-18-85	1.51
07-24-85	11.90
07-30-85	*
08-05-85	15.57
08-11-85	9.97
08-17-85	18.02
08-23-85	13.12
08-29-85	12.54
09-04-85	13.36
09-10-85	6.38
09-16-85	9.73
09-22-85	***
09-28-85	3.41

* FILTER RAN TWICE
*** CHART MALFUNCTION

'N'	13
ARITH.MEAN	11.94
STD.DEV	5.87
GEOM.MEAN	9.92
SGD	2.11

SITE: FT.WINGATE
SAMPLER: SSI

DATE	CONC UG/M3
10-04-85	10.31
10-10-85	4.65
10-16-85	9.72
10-22-85	8.44
10-28-85	8.09
11-03-85	5.81
11-09-85	18.78
11-15-85	5.45
11-21-85	9.50
11-27-85	4.29
12-03-85	*
12-09-85	8.62
12-15-85	7.03
12-21-85	7.84
12-27-85	1.44

* FILTER RAN TWICE

'N'	14
ARITH.MEAN	7.86
STD.DEV	3.99
GEOM.MEAN	6.88
SGD	1.79

SITE: FT.WINGATE
SAMPLER: SSI

DATE	CONC UG/M3
01-02-86	1.71
01-08-86	***
01-14-86	7.86
01-20-86	6.36
01-26-86	2.38
02-01-86	3.24
02-07-86	***
02-13-86	2.13

*** CHART MALFUNCTION

'N'	6
ARITH.MEAN	3.95
STD.DEV	2.55
GEOM.MEAN	3.35
SGD	1.86

APPENDIX E

STAR DATA SUMMARIES

The following contains annual and quarterly frequency distributions and relative frequency distributions for six stability classes. Stability class determination was based on the work performed by Mitchel and Timbre but was modified to include windspeed and solar altitude along with the standard deviation of the horizontal winds direction fluctuation.

The data displayed in this Appendix are also contained on the enclosed 5.25 inch floppy disk. The statistical array (STAR) files including the raw data, output files, quarterly, and annual summaries are contained on the IBM compatable disk. The following disk operating system (DOS) commands will allow access to the files:

- Enter DIR A: to list file names from disk drive A.
- Enter TYPE FILENAME /P: to display files on the monitor one page at a time.
- Enter COPY FILENAME PRN: to print files on the printer.

The data were stored on the disk in ASCII format and are accessable using the DOS commands and without the aid of any software packages.

Note: E stability = D (night)
F stability = combined E and F

THIS TABULATION WAS PREPARED USING THE FOLLOWING INFORMATION

STATION NUMBER = 88888

STATION NAME = QUEMADO, NEW MEXICO

LATITUDE = 108.400

LONGITUDE = 34.300

TIME ZONE = 120.0

THIS RUN HAS STAB D BROKEN INTO DAY/NIGHT

HEMISPHERE = WESTERN

NUMBER OF STABILITY CLASSES = 6

OUTPUT = QUARTERLY AND ANNUAL

PERIOD OF RECORD = 85 3 86 2

NUMBER OF HOURS USED = 24 OBSERVATIONS PER DAY WHEN DATA AVAILABLE

ANNUAL FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.002626	.005137	.002740	.000228	.000000	.000000
NNE	.003539	.003196	.001941	.000685	.000114	.000000
NE	.005936	.011872	.002283	.000457	.000000	.000114
ENE	.013699	.083904	.016438	.000457	.000000	.000000
E	.016210	.124543	.025000	.003881	.000913	.000000
ESE	.006279	.036073	.011872	.003539	.000685	.000000
SE	.003311	.005479	.005251	.003082	.000114	.000000
SSE	.003196	.003881	.004338	.002169	.000000	.000228
S	.003196	.004110	.004680	.005023	.001712	.000342
SSW	.005365	.004110	.006849	.008447	.001712	.000457
SW	.004110	.011644	.012900	.010274	.002626	.001027
WSW	.005251	.023744	.043379	.018950	.005594	.005594
W	.005479	.018607	.036530	.029110	.009247	.002854
WNW	.005594	.009817	.014498	.018607	.005822	.001027
NW	.004338	.007192	.012443	.008447	.002397	.000000
NNW	.002626	.004909	.006050	.001712	.000228	.000000

TOTAL RELATIVE FREQUENCY OF OBSERVATIONS = .816895
TOTAL RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE = .002854

ANNUAL FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	23	45	24	2	0	0
NNE	31	28	17	6	1	0
NE	52	104	20	4	0	1
ENE	120	735	144	4	0	0
E	142	1091	219	34	8	0
ESE	55	316	104	31	6	0
SE	29	48	46	27	1	0
SSE	28	34	38	19	0	2
S	28	36	41	44	15	3
SSW	47	36	60	74	15	4
SW	36	102	113	90	23	9
WSW	46	208	380	166	49	49
W	48	163	320	255	81	25
WNW	49	86	127	163	51	9
NW	38	63	109	74	21	0
NNW	23	43	53	15	2	0

TOTAL NUMBER OF OBSERVATIONS = 7131
TOTAL NUMBER OF CALMS = 25

ANNUAL RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
	SPEED(KTS)					
N	.001030	.000799	.000000	.000000	.000000	.000000
NNE	.001830	.000457	.000000	.000000	.000000	.000000
NE	.002062	.002511	.000000	.000000	.000000	.000000
ENE	.003669	.006050	.000114	.000000	.000000	.000000
E	.004361	.009703	.000571	.000000	.000000	.000000
ESE	.002522	.003881	.000571	.000000	.000000	.000000
SE	.002061	.001712	.000228	.000000	.000000	.000000
SSE	.000688	.000913	.000228	.000000	.000000	.000000
S	.000917	.001484	.000000	.000000	.000000	.000000
SSW	.002059	.000342	.000342	.000000	.000000	.000000
SW	.001604	.002169	.000342	.000000	.000000	.000000
WSW	.001834	.002968	.000228	.000000	.000000	.000000
W	.002063	.002854	.000114	.000000	.000000	.000000
WNW	.001832	.001712	.000571	.000000	.000000	.000000
NW	.001489	.001370	.000228	.000000	.000000	.000000
NNW	.001144	.000571	.000114	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF A STABILITY= .074315
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH A STABILITY = .000114

ANNUAL FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	9	7	0	0	0	0
NNE	16	4	0	0	0	0
NE	18	22	0	0	0	0
ENE	32	53	1	0	0	0
E	38	85	5	0	0	0
ESE	22	34	5	0	0	0
SE	18	15	2	0	0	0
SSE	6	8	2	0	0	0
S	8	13	0	0	0	0
SSW	18	3	3	0	0	0
SW	14	19	3	0	0	0
WSW	16	26	2	0	0	0
W	18	25	1	0	0	0
WNW	16	15	5	0	0	0
NW	13	12	2	0	0	0
NNW	10	5	1	0	0	0

NUMBER OF OCCURRENCES OF A STABILITY = 650
NUMBER OF CALMS WITH A STABILITY = 1

ANNUAL RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000114	.000000	.000000	.000000
NE	.000228	.000342	.000000	.000000	.000000	.000000
ENE	.001027	.004566	.000571	.000000	.000000	.000000
E	.001027	.010274	.001370	.000000	.000000	.000000
ESE	.000342	.001142	.001142	.000114	.000000	.000000
SE	.000000	.000228	.000457	.000000	.000000	.000000
SSE	.000000	.000000	.000342	.000114	.000000	.000000
S	.000000	.000000	.000685	.000000	.000000	.000000
SSW	.000228	.000342	.000342	.000000	.000000	.000000
SW	.000228	.000342	.001027	.000114	.000000	.000000
WSW	.000114	.001256	.001712	.000000	.000000	.000000
W	.000000	.001370	.001712	.000114	.000000	.000000
WNW	.000228	.000571	.001142	.000000	.000000	.000000
NW	.000000	.000000	.000114	.000114	.000000	.000000
NNW	.000000	.000114	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF B STABILITY= .035274
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH B STABILITY = .000000

ANNUAL FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	0	0	0
NNE	0	0	1	0	0	0
NE	2	3	0	0	0	0
ENE	9	40	5	0	0	0
E	9	30	12	0	0	0
ESE	3	10	10	1	0	0
SE	0	2	4	0	0	0
SSE	0	0	3	1	0	0
S	0	0	6	0	0	0
SSW	2	3	3	0	0	0
SW	2	3	9	1	0	0
WSW	1	11	15	0	0	0
W	0	12	15	1	0	0
WNW	2	5	10	0	0	0
NW	0	0	1	1	0	0
NNW	0	1	0	0	0	0

NUMBER OF OCCURRENCES OF B STABILITY = 309
NUMBER OF CALMS WITH B STABILITY = 0

ANNUAL RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED (KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000002	.000228	.000000	.000000	.000000	.000000
NNE	.000232	.000228	.000000	.000000	.000000	.000000
NE	.000349	.000457	.000000	.000000	.000000	.000000
ENE	.002191	.013470	.000913	.000000	.000000	.000000
E	.002249	.020091	.002283	.000114	.000000	.000000
ESE	.000261	.003539	.000799	.000228	.000114	.000000
SE	.000116	.000114	.000114	.000000	.000000	.000000
SSE	.000118	.000342	.000114	.000000	.000000	.000000
S	.000002	.000228	.000000	.000000	.000000	.000000
SSW	.000806	.000000	.000228	.000114	.000000	.000000
SW	.000471	.001142	.000799	.000342	.000114	.000000
WSW	.000594	.002055	.002397	.000342	.000000	.000114
W	.000242	.001370	.001484	.000457	.000000	.000000
WNW	.000580	.000457	.000114	.000228	.000000	.000000
NW	.000346	.000114	.000342	.000114	.000000	.000000
NNW	.000115	.000000	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF C STABILITY= .064384
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH C STABILITY = .000457

ANNUAL FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	2	0	0	0	0
NNE	2	2	0	0	0	0
NE	3	4	0	0	0	0
ENE	18	118	8	0	0	0
E	18	176	20	1	0	0
ESE	2	31	7	2	1	0
SE	1	1	1	0	0	0
SSE	1	3	1	0	0	0
S	0	2	0	0	0	0
SSW	7	0	2	1	0	0
SW	4	10	7	3	1	0
WSW	5	18	21	3	0	1
W	2	12	13	4	0	0
WNW	5	4	1	2	0	0
NW	3	1	3	1	0	0
NNW	1	0	0	0	0	0

NUMBER OF OCCURRENCES OF C STABILITY = 560
NUMBER OF CALMS WITH C STABILITY = 4

ANNUAL RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000114	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000132	.001370	.000457	.000000	.000000	.000000
ENE	.002429	.019292	.004224	.000114	.000000	.000000
E	.001988	.030594	.007078	.001027	.000228	.000000
ESE	.000229	.009361	.002283	.000342	.000114	.000000
SE	.000004	.000342	.000685	.000114	.000000	.000000
SSE	.000000	.000000	.000457	.000342	.000000	.000228
S	.000118	.000228	.000685	.001256	.000571	.000228
SSW	.000003	.000228	.000913	.001941	.000913	.000000
SW	.000252	.001712	.002740	.002055	.001027	.000342
WSW	.000290	.004909	.013014	.006621	.001370	.001027
W	.000136	.001712	.006507	.008562	.002968	.001142
WNW	.000006	.000457	.000799	.001256	.000342	.000114
NW	.000234	.000228	.001370	.000457	.000114	.000000
NNW	.000001	.000114	.000228	.000114	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF D STABILITY= .152854
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH D STABILITY = .000913
(NEUTRAL / DAY)

ANNUAL FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED (KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	1	0	0	0
NNE	0	0	0	0	0	0
NE	1	12	4	0	0	0
ENE	19	169	37	1	0	0
E	14	268	62	9	2	0
ESE	1	82	20	3	1	0
SE	0	3	6	1	0	0
SSE	0	0	4	3	0	2
S	1	2	6	11	5	2
SSW	0	2	8	17	8	0
SW	2	15	24	18	9	3
WSW	2	43	114	58	12	9
W	1	15	57	75	26	10
WNW	0	4	7	11	3	1
NW	2	2	12	4	1	0
NNW	0	1	2	1	0	0

NUMBER OF OCCURRENCES OF D STABILITY = 1331
NUMBER OF CALMS WITH D STABILITY = 8

ANNUAL RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.001610	.003995	.002397	.000000	.000000	.000000
NNE	.001492	.002397	.001027	.000342	.000114	.000000
NE	.002180	.003082	.000799	.000228	.000000	.000114
ENE	.002076	.007648	.001712	.000114	.000000	.000000
E	.004607	.014041	.003311	.000457	.000114	.000000
ESE	.002529	.005594	.002968	.000571	.000228	.000000
SE	.001149	.002397	.002511	.000571	.000000	.000000
SSE	.002293	.002283	.001370	.000457	.000000	.000000
S	.002064	.002169	.001484	.000571	.000457	.000114
SSW	.002179	.002511	.001484	.000799	.000228	.000457
SW	.001610	.003767	.002854	.001598	.000457	.000685
WSW	.002071	.005594	.007078	.002397	.001256	.004452
W	.001728	.005594	.007877	.001826	.002055	.001712
WNW	.002526	.004224	.003995	.002854	.002397	.000913
NW	.002180	.003082	.003539	.001027	.000457	.000000
NNW	.001265	.003082	.002169	.000571	.000114	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF E STABILITY= .182306
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH E STABILITY = .000228
(NEUTRAL / NIGHT)

ANNUAL FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
			SPEED(KTS)			
N	14	35	21	0	0	0
NNE	13	21	9	3	1	0
NE	19	27	7	2	0	1
ENE	18	67	15	1	0	0
E	40	123	29	4	1	0
ESE	22	49	26	5	2	0
SE	10	21	22	5	0	0
SSE	20	20	12	4	0	0
S	18	19	13	5	4	1
SSW	19	22	13	7	2	4
SW	14	33	25	14	4	6
WSW	18	49	62	21	11	39
W	15	49	69	16	18	15
WNW	22	37	35	25	21	8
NW	19	27	31	9	4	0
NNW	11	27	19	5	1	0

NUMBER OF OCCURRENCES OF E STABILITY = 1595
NUMBER OF CALMS WITH E STABILITY = 2

ANNUAL RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000001	.000114	.000228	.000228	.000000	.000000
NNE	.000001	.000114	.000799	.000342	.000000	.000000
NE	.001075	.004110	.001027	.000228	.000000	.000000
ENE	.003073	.032877	.008904	.000228	.000000	.000000
E	.003022	.039840	.010388	.002283	.000571	.000000
ESE	.000693	.012557	.004110	.002283	.000228	.000000
SE	.000006	.000685	.001256	.002397	.000114	.000000
SSE	.000118	.000342	.001826	.001256	.000000	.000000
S	.000115	.000000	.001826	.003196	.000685	.000000
SSW	.000122	.000685	.003539	.005594	.000571	.000000
SW	.000023	.002511	.005137	.006164	.001027	.000000
WSW	.000526	.006963	.018950	.009589	.002968	.000000
W	.001436	.005708	.018836	.018151	.004224	.000000
WNW	.000483	.002397	.007877	.014269	.003082	.000000
NW	.000138	.002397	.006849	.006735	.001826	.000000
NNW	.000125	.001027	.003539	.001027	.000114	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF F STABILITY= .307763
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH F STABILITY = .001142

ANNUAL FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
	SPEED(KTS)					
N	0	1	2	2	0	0
NNE	0	1	7	3	0	0
NE	9	36	9	2	0	0
ENE	24	288	78	2	0	0
E	23	349	91	20	5	0
ESE	5	110	36	20	2	0
SE	0	6	11	21	1	0
SSE	1	3	16	11	0	0
S	1	0	16	28	6	0
SSW	1	6	31	49	5	0
SW	0	22	45	54	9	0
WSW	4	61	166	84	26	0
W	12	50	165	159	37	0
WNW	4	21	69	125	27	0
NW	1	21	60	59	16	0
NNW	1	9	31	9	1	0

NUMBER OF OCCURRENCES OF F STABILITY = 2686
NUMBER OF CALMS WITH F STABILITY = 10

QTR= JFM　　FREQUENCY DISTRIBUTION　　STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.004630	.004167	.000926	.000000	.000000	.000000
NNE	.002778	.002315	.001389	.000000	.000000	.000000
NE	.009259	.015278	.004167	.000000	.000000	.000000
ENE	.017130	.099537	.020833	.000463	.000000	.000000
E	.024074	.139352	.033796	.003704	.000926	.000000
ESE	.011111	.039815	.016667	.004167	.000926	.000000
SE	.003704	.006019	.003704	.004167	.000000	.000000
SSE	.004630	.006019	.002778	.000463	.000000	.000000
S	.004630	.004630	.003241	.000463	.000000	.000000
SSW	.006481	.002315	.005093	.008796	.002315	.000000
SW	.003241	.006944	.014352	.014352	.003241	.000926
WSW	.006481	.026389	.059722	.022685	.007407	.010648
W	.007407	.023611	.044907	.026852	.013889	.005093
WNW	.008796	.013889	.015278	.014352	.007407	.000463
NW	.005556	.006481	.010648	.005093	.001852	.000000
NNW	.004167	.003704	.003241	.000000	.000463	.000000

TOTAL RELATIVE FREQUENCY OF OBSERVATIONS = .926389
TOTAL RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE = .000000

QTR= JFM

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED (KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	10	9	2	0	0	0
NNE	6	5	3	0	0	0
NE	20	33	9	0	0	0
ENE	37	215	45	1	0	0
E	52	301	73	8	2	0
ESE	24	86	36	9	2	0
SE	8	13	8	9	0	0
SSE	10	13	6	1	0	0
S	10	10	7	1	0	0
SSW	14	5	11	19	5	0
SW	7	15	31	31	7	2
WSW	14	57	129	49	16	23
W	16	51	97	58	30	11
WNW	19	30	33	31	16	1
NW	12	14	23	11	4	0
NNW	9	8	7	0	1	0

TOTAL NUMBER OF OBSERVATIONS = 2001

TOTAL NUMBER OF CALMS = 0

QTR= JFM RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.002315	.001852	.000000	.000000	.000000	.000000
NNE	.001389	.000463	.000000	.000000	.000000	.000000
NE	.003241	.004167	.000000	.000000	.000000	.000000
ENE	.005093	.008333	.000000	.000000	.000000	.000000
E	.007407	.014352	.001389	.000000	.000000	.000000
ESE	.006019	.005556	.000463	.000000	.000000	.000000
SE	.003241	.003704	.000000	.000000	.000000	.000000
SSE	.001389	.001852	.000463	.000000	.000000	.000000
S	.002315	.002778	.000000	.000000	.000000	.000000
SSW	.003704	.000000	.000926	.000000	.000000	.000000
SW	.002778	.002778	.000926	.000000	.000000	.000000
WSW	.002315	.004167	.000463	.000000	.000000	.000000
W	.003704	.005556	.000463	.000000	.000000	.000000
WNW	.004630	.005093	.001389	.000000	.000000	.000000
NW	.001389	.002315	.000463	.000000	.000000	.000000
NNW	.001852	.000926	.000463	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF A STABILITY= .124074
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH A STABILITY = .000000

QTR= JFM FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	5	4	0	0	0	0
NNE	3	1	0	0	0	0
NE	7	9	0	0	0	0
ENE	11	18	0	0	0	0
E	16	31	3	0	0	0
ESE	13	12	1	0	0	0
SE	7	8	0	0	0	0
SSE	3	4	1	0	0	0
S	5	6	0	0	0	0
SSW	8	0	2	0	0	0
SW	6	6	2	0	0	0
WSW	5	9	1	0	0	0
W	8	12	1	0	0	0
WNW	10	11	3	0	0	0
NW	3	5	1	0	0	0
NNW	4	2	1	0	0	0

NUMBER OF OCCURRENCES OF A STABILITY = 268
NUMBER OF CALMS WITH A STABILITY = 0

QTR= JFM RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000463	.000463	.000000	.000000	.000000	.000000
ENE	.000463	.004630	.001389	.000000	.000000	.000000
E	.001389	.013889	.002315	.000000	.000000	.000000
ESE	.000926	.003241	.003704	.000463	.000000	.000000
SE	.000000	.000000	.000000	.000000	.000000	.000000
SSE	.000000	.000000	.000463	.000000	.000000	.000000
S	.000000	.000000	.000926	.000000	.000000	.000000
SSW	.000463	.000463	.001389	.000000	.000000	.000000
SW	.000000	.000463	.001389	.000000	.000000	.000000
WSW	.000463	.000926	.004630	.000000	.000000	.000000
W	.000000	.002778	.004630	.000463	.000000	.000000
WNW	.000000	.000926	.002315	.000000	.000000	.000000
NW	.000000	.000000	.000000	.000463	.000000	.000000
NNW	.000000	.000000	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF B STABILITY= .056481
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH B STABILITY = .000000

QTR= JFM FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	1 - 3	4 - 6	SPEED(KTS) 7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	1	1	0	0	0	0
ENE	1	10	3	0	0	0
E	3	30	5	0	0	0
ESE	2	7	8	1	0	0
SE	0	0	0	0	0	0
SSE	0	0	1	0	0	0
S	0	0	2	0	0	0
SSW	1	1	3	0	0	0
SW	0	1	3	0	0	0
WSW	1	2	10	0	0	0
W	0	6	10	1	0	0
WNW	0	2	5	0	0	0
NW	0	0	0	1	0	0
NNW	0	0	0	0	0	0

NUMBER OF OCCURRENCES OF B STABILITY = 122
NUMBER OF CALMS WITH B STABILITY = 0

QTR= JFM RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000926	.000463	.000000	.000000	.000000	.000000
ENE	.002315	.018981	.002315	.000000	.000000	.000000
E	.003241	.028241	.003704	.000000	.000000	.000000
ESE	.000000	.006481	.000926	.000463	.000463	.000000
SE	.000000	.000000	.000000	.000000	.000000	.000000
SSE	.000000	.000463	.000463	.000000	.000000	.000000
S	.000000	.000463	.000000	.000000	.000000	.000000
SSW	.000463	.000000	.000000	.000000	.000000	.000000
SW	.000463	.000463	.001852	.000926	.000000	.000000
WSW	.000463	.003241	.007407	.000926	.000000	.000000
W	.000463	.002778	.004167	.000463	.000000	.000000
WNW	.001389	.000926	.000463	.000926	.000000	.000000
NW	.000463	.000000	.001389	.000463	.000000	.000000
NNW	.000463	.000000	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF C STABILITY= .100463
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH C STABILITY = .000000

QTR= JFM

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	2	1	0	0	0	0
ENE	5	41	5	0	0	0
E	7	61	8	0	0	0
ESE	0	14	2	1	1	0
SE	0	0	0	0	0	0
SSE	0	1	1	0	0	0
S	0	1	0	0	0	0
SSW	1	0	0	0	0	0
SW	1	1	4	2	0	0
WSW	1	7	16	2	0	0
W	1	6	9	1	0	0
WNW	3	2	1	2	0	0
NW	1	0	3	1	0	0
NNW	1	0	0	0	0	0

NUMBER OF OCCURRENCES OF C STABILITY = 217
NUMBER OF CALMS WITH C STABILITY = 0

QTR= JFM

RELATIVE FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
			SPEED(KTS)			
N	.000000	.000000	.000463	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000463	.003241	.000926	.000000	.000000	.000000
ENE	.003241	.025463	.006944	.000463	.000000	.000000
E	.004630	.042593	.016204	.003241	.000000	.000000
ESE	.000000	.015278	.005556	.001389	.000926	.000000
SE	.000000	.000000	.000463	.000463	.000463	.000000
SSE	.000000	.000000	.000463	.000000	.000000	.000000
S	.000000	.000000	.000926	.000000	.000000	.000000
SSW	.000000	.000000	.000926	.002778	.000000	.000000
SW	.000000	.000463	.003704	.004630	.001852	.000000
WSW	.000000	.006481	.023148	.012963	.001852	.000926
W	.000000	.004167	.012500	.010185	.001852	.001389
WNW	.000000	.001852	.001852	.002315	.004630	.001852
NW	.000926	.000463	.003241	.000463	.000926	.000463
NNW	.000000	.000000	.000926	.000000	.000463	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF D STABILITY= .243981

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH D STABILITY = .000000

(NEUTRAL / DAY)

QTR= JFM　　FREQUENCY DISTRIBUTION　　STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	1	0	0	0
NNE	0	0	0	0	0	0
NE	1	7	2	0	0	0
ENE	7	55	15	1	0	0
E	10	92	35	7	2	0
ESE	0	33	12	3	1	0
SE	0	0	1	1	0	0
SSE	0	0	1	0	0	0
S	0	0	2	0	0	0
SSW	0	0	2	6	4	0
SW	0	1	8	10	4	2
WSW	0	14	50	28	4	3
W	0	9	27	22	10	4
WNW	0	4	4	5	2	1
NW	2	1	7	1	1	0
NNW	0	0	2	0	0	0

NUMBER OF OCCURRENCES OF D STABILITY = 527
NUMBER OF CALMS WITH D STABILITY = 0
(NEUTRAL / DAY)

QTR= JFM

RELATIVE FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED (KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.002315	.002315	.000463	.000000	.000000	.000000
NNE	.001389	.001389	.000000	.000000	.000000	.000000
NE	.002315	.002778	.001389	.000000	.000000	.000000
ENE	.002315	.007870	.000463	.000000	.000000	.000000
E	.005093	.012037	.001389	.000000	.000000	.000000
ESE	.003241	.006481	.002778	.000463	.000000	.000000
SE	.000463	.002315	.001852	.001389	.000000	.000000
SSE	.003241	.003241	.000000	.000463	.000000	.000000
S	.002315	.001389	.001389	.000463	.000000	.000000
SSW	.001852	.001852	.000463	.000463	.000000	.000000
SW	.000000	.000926	.001389	.000926	.000000	.000000
WSW	.001852	.004630	.004630	.000463	.001389	.009259
W	.002778	.003241	.003704	.000463	.003704	.003241
WNW	.002315	.003704	.001852	.001389	.002778	.000000
NW	.002778	.001852	.000000	.000463	.000000	.000000
NNW	.001389	.002315	.000463	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF E STABILITY= .143519
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH E STABILITY = .000000
(NEUTRAL / NIGHT)

QTR= JFM

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	5	5	1	0	0	0
NNE	3	3	0	0	0	0
NE	5	6	3	0	0	0
ENE	5	17	1	0	0	0
E	11	26	3	0	0	0
ESE	7	14	6	1	0	0
SE	1	5	4	3	0	0
SSE	7	7	0	1	0	0
S	5	3	3	1	0	0
SSW	4	4	1	1	0	0
SW	0	2	3	2	0	0
WSW	4	10	10	1	0	0
W	6	7	8	1	3	20
WNW	5	8	4	3	8	7
NW	6	4	0	1	6	0
NNW	3	5	1	0	0	0

NUMBER OF OCCURRENCES OF E STABILITY = 310
NUMBER OF CALMS WITH E STABILITY = 0
(NEUTRAL / NIGHT)

QTR= JFM   RELATIVE FREQUENCY DISTRIBUTION   STATION = QUEMADO, NEW MEXICO

	SPEED(KTS)					
DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000463	.001389	.000000	.000000	.000000
NE	.001852	.004167	.001852	.000000	.000000	.000000
ENE	.003704	.034259	.009722	.000000	.000000	.000000
E	.002315	.028241	.008796	.000463	.000000	.000000
ESE	.000926	.002778	.003241	.001389	.000000	.000000
SE	.000000	.000000	.001389	.002315	.000000	.000000
SSE	.000000	.000463	.000926	.000000	.000000	.000000
S	.000000	.000000	.000000	.000000	.000000	.000000
SSW	.000000	.000000	.001389	.005556	.000463	.000000
SW	.000000	.001852	.005093	.007870	.001389	.000000
WSW	.001389	.006944	.019444	.008333	.004167	.000000
W	.000463	.005093	.019444	.015278	.005556	.000000
WNW	.000463	.001389	.007407	.009722	.003704	.000000
NW	.000000	.001852	.005556	.003241	.001389	.000000
NNW	.000463	.000463	.001389	.000000	.000463	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF F STABILITY= .257870
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH F STABILITY = .000000

QTR= JFM

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
			SPEED(KTS)			
N	0	0	0	0	0	0
NNE	0	1	3	0	0	0
NE	4	9	4	0	0	0
ENE	8	74	21	0	0	0
E	5	61	19	1	0	0
ESE	2	6	7	3	0	0
SE	0	0	3	5	0	0
SSE	0	1	2	0	0	0
S	0	0	0	0	0	0
SSW	0	0	3	12	1	0
SW	0	4	11	17	3	0
WSW	3	15	42	18	9	0
W	1	11	42	33	12	0
WNW	1	3	16	21	8	0
NW	0	4	12	7	3	0
NNW	1	1	3	0	1	0

NUMBER OF OCCURRENCES OF F STABILITY = 557
NUMBER OF CALMS WITH F STABILITY = 0

QTR= AMJ FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
			SPEED(KTS)			
N	.002763	.012363	.007326	.000458	.000000	.000000
NNE	.003214	.005495	.001832	.000916	.000000	.000000
NE	.004133	.007784	.001374	.001832	.000000	.000000
ENE	.006481	.061813	.018773	.000916	.000000	.000000
E	.008380	.125000	.034341	.008242	.002289	.000000
ESE	.006025	.063645	.010073	.003663	.000916	.000000
SE	.001840	.006410	.004579	.005037	.000458	.000000
SSE	.001377	.002289	.003205	.002747	.000000	.000000
S	.001837	.003663	.003205	.004121	.001374	.000458
SSW	.002754	.004121	.004121	.006868	.000458	.001832
SW	.003677	.009615	.010531	.016484	.003663	.002747
WSW	.003226	.016941	.039835	.023810	.008242	.005495
W	.004602	.017399	.065018	.046703	.007784	.003663
WNW	.004144	.017857	.027015	.049908	.014652	.003663
NW	.005514	.013736	.026099	.025641	.007326	.000000
NNW	.002762	.011447	.015568	.005952	.000458	.000000

TOTAL RELATIVE FREQUENCY OF OBSERVATIONS = .983516
TOTAL RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE = .000458

QTR= AMJ　　　FREQUENCY DISTRIBUTION　　　STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	6	27	16	1	0	0
NNE	7	12	4	2	0	0
NE	9	17	3	4	0	0
ENE	14	135	41	2	0	0
E	18	273	75	18	5	0
ESE	13	139	22	8	2	0
SE	4	14	10	11	1	0
SSE	3	5	7	6	0	0
S	4	8	7	9	3	1
SSW	6	9	9	15	1	4
SW	8	21	23	36	8	6
WSW	7	37	87	52	18	12
W	10	38	142	102	17	8
WNW	9	39	59	109	32	8
NW	12	30	57	56	16	0
NNW	6	25	34	13	1	0

TOTAL NUMBER OF OBSERVATIONS = 2148
TOTAL NUMBER OF CALMS = 1

QTR= AMJ   RELATIVE FREQUENCY DISTRIBUTION   STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000458	.000458	.000000	.000000	.000000	.000000
NE	.000916	.000458	.000000	.000000	.000000	.000000
ENE	.000916	.002289	.000000	.000000	.000000	.000000
E	.000000	.005037	.000000	.000000	.000000	.000000
ESE	.001374	.003205	.000000	.000000	.000000	.000000
SE	.000916	.000458	.000000	.000000	.000000	.000000
SSE	.000000	.000000	.000000	.000000	.000000	.000000
S	.000000	.000916	.000000	.000000	.000000	.000000
SSW	.000458	.000000	.000000	.000000	.000000	.000000
SW	.000000	.000916	.000458	.000000	.000000	.000000
WSW	.000000	.000458	.000000	.000000	.000000	.000000
W	.000458	.000000	.000000	.000000	.000000	.000000
WNW	.000000	.000916	.000000	.000000	.000000	.000000
NW	.000458	.000458	.000000	.000000	.000000	.000000
NNW	.000000	.000916	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF A STABILITY= .022894
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH A STABILITY = .000000

QTR= AMJ   FREQUENCY DISTRIBUTION   STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	0	0	0
NNE	1	1	0	0	0	0
NE	2	1	0	0	0	0
ENE	2	5	0	0	0	0
E	0	11	0	0	0	0
ESE	3	7	0	0	0	0
SE	2	1	0	0	0	0
SSE	0	0	0	0	0	0
S	0	2	0	0	0	0
SSW	1	0	0	0	0	0
SW	0	2	1	0	0	0
WSW	0	1	0	0	0	0
W	1	0	0	0	0	0
WNW	0	2	0	0	0	0
NW	1	1	0	0	0	0
NNW	0	2	0	0	0	0

NUMBER OF OCCURRENCES OF A STABILITY = 50
NUMBER OF CALMS WITH A STABILITY = 0

QTR= AMJ RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000000	.000000	.000000	.000000	.000000	.000000
ENE	.000000	.000916	.000000	.000000	.000000	.000000
E	.000000	.005037	.001374	.000000	.000000	.000000
ESE	.000000	.000458	.000000	.000000	.000000	.000000
SE	.000000	.000000	.000458	.000000	.000000	.000000
SSE	.000000	.000000	.000000	.000458	.000000	.000000
S	.000000	.000000	.000000	.000000	.000000	.000000
SSW	.000000	.000000	.000000	.000000	.000000	.000000
SW	.000000	.000000	.000000	.000000	.000000	.000000
WSW	.000000	.000458	.000458	.000000	.000000	.000000
W	.000000	.000000	.000458	.000000	.000000	.000000
WNW	.000000	.000458	.000458	.000000	.000000	.000000
NW	.000000	.000000	.000000	.000000	.000000	.000000
NNW	.000000	.000000	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF B STABILITY= .010989
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH B STABILITY = .000000

QTR= AMJ

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	2	0	0	0	0
E	0	11	3	0	0	0
ESE	0	1	0	0	0	0
SE	0	0	1	0	0	0
SSE	0	0	0	1	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	1	1	0	0	0
W	0	0	1	0	0	0
WNW	0	1	1	0	0	0
NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0

NUMBER OF OCCURRENCES OF B STABILITY = 24
NUMBER OF CALMS WITH B STABILITY = 0

QTR= AMJ

RELATIVE FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000000	.000000	.000000	.000000	.000000	.000000
ENE	.000000	.001832	.000458	.000000	.000000	.000000
E	.000458	.004579	.001832	.000458	.000000	.000000
ESE	.000458	.004121	.000916	.000000	.000000	.000000
SE	.000000	.000000	.000000	.000000	.000000	.000000
SSE	.000000	.000000	.000000	.000000	.000000	.000000
S	.000000	.000000	.000000	.000000	.000000	.000000
SSW	.000000	.000000	.000000	.000458	.000000	.000000
SW	.000000	.000000	.000000	.000000	.000000	.000000
WSW	.000000	.000458	.000458	.000000	.000000	.000000
W	.000000	.000000	.000458	.000458	.000000	.000000
WNW	.000000	.000000	.000000	.000000	.000000	.000000
NW	.000000	.000000	.000000	.000000	.000000	.000000
NNW	.000000	.000000	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF C STABILITY= .017399
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH C STABILITY = .000000

QTR= AMJ FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	4	1	0	0	0
E	1	10	4	1	0	0
ESE	1	9	2	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	1	0	0
SW	0	0	0	0	0	0
WSW	0	1	1	0	0	0
W	0	0	1	1	0	0
WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0

NUMBER OF OCCURRENCES OF C STABILITY = 38
NUMBER OF CALMS WITH C STABILITY = 0

QTR= AMJ RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000000	.000000	.000000	.000000	.000000	.000000
ENE	.000000	.001374	.000458	.000000	.000000	.000000
E	.000000	.010073	.003663	.000916	.000000	.000000
ESE	.000000	.009615	.001374	.000000	.000000	.000000
SE	.000000	.000000	.000458	.000000	.000000	.000000
SSE	.000000	.000000	.000000	.000458	.000000	.000000
S	.000000	.000000	.000000	.000000	.000458	.000000
SSW	.000000	.000000	.000000	.000000	.000000	.000000
SW	.000000	.000000	.000000	.000458	.000000	.000000
WSW	.000000	.000458	.002289	.000458	.000000	.000000
W	.000000	.000458	.004121	.002289	.000458	.000000
WNW	.000000	.000000	.000458	.000458	.000000	.000000
NW	.000000	.000000	.000000	.000000	.000000	.000000
NNW	.000000	.000458	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF D STABILITY= .041209
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH D STABILITY = .000000
(NEUTRAL / DAY)

QTR= AMJ

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	1 - 3	4 - 6	SPEED(KTS) 7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	3	1	0	0	0
E	0	22	8	2	0	0
ESE	0	21	3	0	0	0
SE	0	0	1	0	0	0
SSE	0	0	0	1	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	1	0
SW	0	0	0	0	0	0
WSW	0	1	0	1	0	0
W	0	1	5	1	0	0
WNW	0	0	9	5	1	0
NW	0	0	1	1	0	0
NNW	0	1	0	0	0	0

NUMBER OF OCCURRENCES OF D STABILITY = 90
NUMBER OF CALMS WITH D STABILITY = 0
(NEUTRAL / DAY)

QTR= AMJ RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
	SPEED(KTS)					
N	.002785	.011905	.006410	.000000	.000000	.000000
NNE	.002767	.005037	.001832	.000458	.000000	.000000
NE	.003228	.005495	.000916	.000916	.000000	.000000
ENE	.003701	.010989	.002289	.000458	.000000	.000000
E	.003737	.024725	.005037	.000458	.000458	.000000
ESE	.003237	.009158	.001832	.000916	.000000	.000000
SE	.000930	.004579	.002747	.000458	.000000	.000000
SSE	.001383	.002289	.002289	.000458	.000000	.000000
S	.001843	.002747	.001374	.000458	.000458	.000458
SSW	.002305	.003663	.000916	.001374	.000458	.001832
SW	.003690	.006868	.005952	.004579	.001374	.002747
WSW	.003235	.008242	.015568	.006868	.003205	.005495
W	.002779	.009615	.021062	.005495	.002747	.003663
WNW	.003238	.009615	.010073	.009615	.006868	.003663
NW	.004614	.009158	.011447	.003663	.001374	.000000
NNW	.002772	.006868	.006410	.002289	.000458	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF E STABILITY= .347070
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH E STABILITY = .000458
(NEUTRAL / NIGHT)

QTR= AMJ

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	6	26	14	0	0	0
NNE	6	11	4	1	0	0
NE	7	12	2	2	0	0
ENE	8	24	5	1	0	0
E	8	54	11	1	1	0
ESE	7	20	4	2	0	0
SE	2	10	6	1	0	0
SSE	3	5	5	1	0	0
S	4	6	3	1	1	1
SSW	5	8	2	3	1	4
SW	8	15	13	10	3	6
WSW	7	18	34	15	7	12
W	6	21	46	12	6	8
WNW	7	21	22	21	15	8
NW	10	20	25	8	3	0
NNW	6	15	14	5	1	0

NUMBER OF OCCURRENCES OF E STABILITY = 757
NUMBER OF CALMS WITH E STABILITY = 1
(NEUTRAL / NIGHT)

QTR= AMJ

RELATIVE FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000458	.000916	.000458	.000000	.000000
NNE	.000000	.000000	.000000	.000458	.000000	.000000
NE	.000000	.001832	.000458	.000916	.000000	.000000
ENE	.001832	.044414	.015568	.000458	.000000	.000000
E	.004121	.075549	.022436	.006410	.001832	.000000
ESE	.000916	.037088	.005952	.002747	.000916	.000000
SE	.000000	.001374	.000916	.004579	.000458	.000000
SSE	.000000	.000000	.000916	.001374	.000000	.000000
S	.000000	.000000	.001832	.003663	.000458	.000000
SSW	.000000	.000458	.003205	.005037	.000000	.000000
SW	.000000	.001832	.004121	.011447	.002289	.000000
WSW	.000000	.006868	.021062	.016484	.005037	.000000
W	.001374	.007326	.038919	.038462	.004579	.000000
WNW	.000916	.006868	.016026	.039835	.007784	.000000
NW	.000458	.004121	.014652	.021978	.005952	.000000
NNW	.000000	.003205	.009158	.003663	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF F STABILITY= .544414
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH F STABILITY = .000000

QTR= AMJ FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
			SPEED(KTS)			
N	0	1	2	1	0	0
NNE	0	0	0	1	0	0
NE	0	4	1	2	0	0
ENE	4	97	34	1	0	0
E	9	165	49	14	4	0
ESE	2	81	13	6	2	0
SE	0	3	2	10	1	0
SSE	0	0	2	3	0	0
S	0	0	4	8	1	0
SSW	0	1	7	11	0	0
SW	0	4	9	25	5	0
WSW	0	15	46	36	11	0
W	3	16	85	84	10	0
WNW	2	15	35	87	17	0
NW	1	9	32	48	13	0
NNW	0	7	20	8	0	0

NUMBER OF OCCURRENCES OF F STABILITY = 1189
NUMBER OF CALMS WITH F STABILITY = 0

QTR= JAS FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
			SPEED(KTS)			
N	.000453	.000453	.002717	.000453	.000000	.000000
NNE	.000906	.001812	.004076	.001812	.000453	.000000
NE	.003623	.004982	.002717	.000000	.000000	.000453
ENE	.002717	.040308	.008152	.000453	.000000	.000000
E	.009058	.064764	.015851	.003170	.000453	.000000
ESE	.002717	.017663	.014946	.005888	.000906	.000000
SE	.001812	.004529	.006341	.002264	.000000	.000000
SSE	.000906	.002717	.005888	.002264	.000000	.000000
S	.001359	.000453	.005435	.006793	.003170	.000000
SSW	.002717	.002264	.007699	.004076	.000906	.000000
SW	.000000	.004982	.006341	.003170	.000453	.000000
WSW	.000906	.007699	.014493	.005888	.000906	.000000
W	.001359	.008152	.009058	.011775	.004529	.000000
WNW	.001812	.001359	.004529	.004529	.000453	.000000
NW	.001812	.001359	.005888	.000906	.000000	.000000
NNW	.000453	.001812	.003623	.000453	.000000	.000000

TOTAL RELATIVE FREQUENCY OF OBSERVATIONS = .382246
TOTAL RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE = .000000

QTR= JAS

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	1	1	6	1	0	0
NNE	2	4	9	4	1	0
NE	8	11	6	0	0	1
ENE	6	89	18	1	0	0
E	20	143	35	7	1	0
ESE	6	39	33	13	2	0
SE	4	10	14	5	0	0
SSE	2	6	13	5	0	0
S	3	1	12	15	7	0
SSW	6	5	17	9	2	0
SW	0	11	14	7	1	0
WSW	2	17	32	13	2	0
W	3	18	20	26	10	0
WNW	4	3	10	10	1	0
NW	4	3	13	2	0	0
NNW	1	4	8	1	0	0

TOTAL NUMBER OF OBSERVATIONS = 844
TOTAL NUMBER OF CALMS = 0

QTR= JAS   RELATIVE FREQUENCY DISTRIBUTION   STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000453	.000000	.000000	.000000	.000000
NNE	.000906	.000453	.000000	.000000	.000000	.000000
NE	.001359	.001359	.000000	.000000	.000000	.000000
ENE	.001359	.002717	.000000	.000000	.000000	.000000
E	.002717	.004076	.000000	.000000	.000000	.000000
ESE	.000000	.001812	.000906	.000000	.000000	.000000
SE	.000906	.000906	.000000	.000000	.000000	.000000
SSE	.000000	.000453	.000000	.000000	.000000	.000000
S	.000000	.000000	.000000	.000000	.000000	.000000
SSW	.000453	.000453	.000000	.000000	.000000	.000000
SW	.000000	.000000	.000000	.000000	.000000	.000000
WSW	.000453	.001359	.000000	.000000	.000000	.000000
W	.000906	.000453	.000000	.000000	.000000	.000000
WNW	.000000	.000000	.000000	.000000	.000000	.000000
NW	.001359	.000000	.000453	.000000	.000000	.000000
NNW	.000453	.000000	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF A STABILITY= .026721
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH A STABILITY = .000000

QTR= JAS

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	1	0	0	0	0
NNE	2	1	0	0	0	0
NE	3	3	0	0	0	0
ENE	3	6	0	0	0	0
E	6	9	0	0	0	0
ESE	0	4	2	0	0	0
SE	2	2	0	0	0	0
SSE	0	1	0	0	0	0
S	0	0	0	0	0	0
SSW	1	1	0	0	0	0
SW	0	0	0	0	0	0
WSW	1	3	0	0	0	0
W	2	1	0	0	0	0
WNW	0	0	0	0	0	0
NW	3	0	1	0	0	0
NNW	1	0	0	0	0	0

NUMBER OF OCCURRENCES OF A STABILITY = 59
NUMBER OF CALMS WITH A STABILITY = 0

QTR= JAS

RELATIVE FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
			SPEED(KTS)			
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000453	.000000	.000000	.000000
NE	.000453	.000453	.000000	.000000	.000000	.000000
ENE	.000453	.001812	.000453	.000000	.000000	.000000
E	.000906	.002717	.000906	.000000	.000000	.000000
ESE	.000453	.000000	.000453	.000000	.000000	.000000
SE	.000000	.000000	.000453	.000000	.000000	.000000
SSE	.000000	.000000	.000453	.000000	.000000	.000000
S	.000000	.000000	.000453	.000000	.000000	.000000
SSW	.000000	.000000	.000000	.000000	.000000	.000000
SW	.000000	.000000	.000000	.000000	.000000	.000000
WSW	.000000	.000906	.000453	.000000	.000000	.000000
W	.000000	.000453	.000000	.000000	.000000	.000000
WNW	.000000	.000000	.000453	.000000	.000000	.000000
NW	.000000	.000000	.000453	.000000	.000000	.000000
NNW	.000000	.000000	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF B STABILITY= .013587
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH B STABILITY = .000000

QTR= JAS

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	0	0	0
NNE	0	0	1	0	0	0
NE	1	1	0	0	0	0
ENE	1	4	1	0	0	0
E	2	6	2	0	0	0
ESE	1	0	1	0	0	0
SE	0	0	1	0	0	0
SSE	0	0	1	0	0	0
S	0	0	1	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	2	1	0	0	0
W	0	1	0	0	0	0
WNW	0	0	1	0	0	0
NW	0	0	1	0	0	0
NNW	0	0	0	0	0	0

NUMBER OF OCCURRENCES OF B STABILITY = 30

NUMBER OF CALMS WITH B STABILITY = 0

QTR= JAS RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
			SPEED(KTS)			
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000000	.000000	.000000	.000000	.000000	.000000
ENE	.000000	.009058	.000000	.000000	.000000	.000000
E	.000906	.009058	.001359	.000000	.000000	.000000
ESE	.000000	.000906	.000453	.000000	.000000	.000000
SE	.000000	.000000	.000000	.000000	.000000	.000000
SSE	.000000	.000000	.000000	.000000	.000000	.000000
S	.000000	.000000	.000000	.000000	.000000	.000000
SSW	.000000	.000000	.000000	.000000	.000000	.000000
SW	.000000	.000453	.000000	.000000	.000000	.000000
WSW	.000000	.000000	.000000	.000000	.000000	.000000
W	.000000	.000000	.000000	.000000	.000000	.000000
WNW	.000000	.000000	.000000	.000000	.000000	.000000
NW	.000000	.000000	.000000	.000000	.000000	.000000
NNW	.000000	.000000	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF C STABILITY= .022192
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH C STABILITY = .000000

QTR= JAS

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	20	0	0	0	0
E	2	20	3	0	0	0
ESE	0	2	1	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	1	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0

NUMBER OF OCCURRENCES OF C STABILITY = 49
NUMBER OF CALMS WITH C STABILITY = 0

QTR= JAS

RELATIVE FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000000	.000000	.000000	.000000	.000000	.000000
ENE	.000000	.008152	.000453	.000000	.000000	.000000
E	.000453	.016304	.001359	.000000	.000000	.000000
ESE	.000453	.003623	.000453	.000000	.000000	.000000
SE	.000000	.000453	.001359	.000000	.000000	.000000
SSE	.000000	.000000	.000453	.000000	.000000	.000000
S	.000000	.000000	.000000	.000000	.000000	.000000
SSW	.000000	.000000	.000000	.000000	.000000	.000000
SW	.000000	.000000	.000000	.000000	.000000	.000000
WSW	.000000	.000453	.000906	.000000	.000000	.000000
W	.000000	.000000	.000453	.000453	.000000	.000000
WNW	.000000	.000000	.000000	.000000	.000000	.000000
NW	.000000	.000000	.000000	.000000	.000000	.000000
NNW	.000000	.000000	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF D STABILITY= .035779
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH D STABILITY = .000000
(NEUTRAL / DAY)

QTR= JAS   FREQUENCY DISTRIBUTION   STATION = QUEMADO, NEW MEXICO

DIRECTION	1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
			SPEED(KTS)			
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	18	1	0	0	0
E	1	36	3	0	0	0
ESE	1	8	1	0	0	0
SE	0	1	3	0	0	0
SSE	0	0	1	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	1	2	1	0	0
W	0	0	1	0	0	0
WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0

NUMBER OF OCCURRENCES OF D STABILITY = 79
NUMBER OF CALMS WITH D STABILITY = 0
(NEUTRAL / DAY)

QTR= JAS

RELATIVE FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000453	.000000	.002717	.000000	.000000	.000000
NNE	.000000	.001359	.002264	.000906	.000453	.000000
NE	.001359	.001359	.000906	.000000	.000000	.000453
ENE	.000000	.004076	.003623	.000000	.000000	.000000
E	.002717	.009964	.005435	.001359	.000000	.000000
ESE	.001359	.004529	.007246	.000906	.000906	.000000
SE	.000906	.002717	.004076	.000453	.000000	.000000
SSE	.000453	.001812	.001359	.000453	.000000	.000000
S	.001359	.000453	.001812	.001359	.001359	.000000
SSW	.002264	.001812	.004076	.001359	.000453	.000000
SW	.000000	.004076	.002717	.000906	.000453	.000000
WSW	.000453	.003170	.005435	.000906	.000453	.000000
W	.000000	.006341	.004076	.000453	.000000	.000000
WNW	.001812	.000906	.001359	.000000	.000000	.000000
NW	.000453	.000000	.001359	.000000	.000000	.000000
NNW	.000000	.001812	.001359	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF E STABILITY= .121377
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH E STABILITY = .000000
(NEUTRAL / NIGHT)

QTR= JAS

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	1	0	6	0	0	0
NNE	0	3	5	2	1	0
NE	3	3	2	0	0	1
ENE	0	9	8	0	0	0
E	6	22	12	3	0	0
ESE	3	10	16	2	2	0
SE	2	6	9	1	0	0
SSE	1	4	3	1	0	0
S	3	1	4	3	3	0
SSW	5	4	9	3	1	0
SW	0	9	6	2	1	0
WSW	1	7	12	2	1	0
W	0	14	9	1	0	0
WNW	4	2	3	0	0	0
NW	1	0	3	0	0	0
NNW	0	4	3	0	0	0

NUMBER OF OCCURRENCES OF E STABILITY = 268
NUMBER OF CALMS WITH E STABILITY = 0
(NEUTRAL / NIGHT)

QTR= JAS   RELATIVE FREQUENCY DISTRIBUTION   STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000453	.000000	.000000
NNE	.000000	.000000	.001359	.000906	.000000	.000000
NE	.000453	.001812	.001812	.000000	.000000	.000000
ENE	.000906	.014493	.003623	.000453	.000000	.000000
E	.001359	.022645	.006793	.001812	.000453	.000000
ESE	.000453	.006793	.005435	.004982	.000000	.000000
SE	.000000	.000453	.000453	.001812	.000000	.000000
SSE	.000453	.000453	.003623	.001812	.000000	.000000
S	.000000	.000000	.003170	.005435	.001812	.000000
SSW	.000000	.000000	.003623	.002717	.000453	.000000
SW	.000000	.000453	.003623	.002264	.000000	.000000
WSW	.000000	.001812	.007699	.004529	.000453	.000000
W	.000453	.000906	.004529	.011322	.004529	.000000
WNW	.000000	.000453	.002717	.004529	.000453	.000000
NW	.000000	.001359	.003623	.000906	.000000	.000000
NNW	.000000	.000000	.002264	.000453	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF F STABILITY= .162591
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH F STABILITY = .000000

QTR= JAS FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	1	0	0
NNE	0	0	3	2	0	0
NE	1	4	4	0	0	0
ENE	2	32	8	1	0	0
E	3	50	15	4	1	0
ESE	1	15	12	11	0	0
SE	0	1	1	4	0	0
SSE	1	1	8	4	0	0
S	0	0	7	12	4	0
SSW	0	0	8	6	1	0
SW	0	1	8	5	0	0
WSW	0	4	17	10	1	0
W	1	2	10	25	10	0
WNW	0	1	6	10	1	0
NW	0	3	8	2	0	0
NNW	0	0	5	1	0	0

NUMBER OF OCCURRENCES OF F STABILITY = 359
NUMBER OF CALMS WITH F STABILITY = 0

QTR= OND FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.002826	.003623	.000000	.000000	.000000	.000000
NNE	.007425	.003170	.000453	.000000	.000000	.000000
NE	.007244	.019475	.000906	.000000	.000000	.000000
ENE	.031324	.134058	.018116	.000000	.000000	.000000
E	.026863	.169384	.016304	.000453	.000000	.000000
ESE	.005932	.023551	.005888	.000453	.000000	.000000
SE	.006074	.004982	.006341	.000906	.000000	.000000
SSE	.006067	.004529	.005435	.003170	.000000	.000906
S	.005200	.007699	.006793	.008605	.002264	.000906
SSW	.009806	.007699	.010417	.014040	.003170	.000000
SW	.010102	.024909	.020380	.007246	.003170	.000453
WSW	.011350	.043931	.059783	.023551	.005888	.006341
W	.009188	.025362	.027627	.031250	.010870	.002717
WNW	.007940	.006341	.011322	.005888	.000906	.000000
NW	.004731	.007246	.007246	.002264	.000453	.000000
NNW	.003271	.002717	.001812	.000453	.000000	.000000

TOTAL RELATIVE FREQUENCY OF OBSERVATIONS = .968297
TOTAL RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE = .010870

QTR= OND

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	1 - 3	4 - 6	SPEED (KTS) 7 - 10	11-16	17-21	GREATER THAN 21
N	6	8	0	0	0	0
NNE	16	7	1	0	0	0
NE	15	43	2	0	0	0
ENE	63	296	40	0	0	0
E	52	374	36	1	0	0
ESE	12	52	13	1	0	0
SE	13	11	14	2	0	0
SSE	13	10	12	7	0	0
S	11	17	15	19	0	2
SSW	21	17	23	31	5	2
SW	21	55	45	16	7	0
WSW	23	97	132	52	7	1
W	19	56	61	69	13	14
WNW	17	14	25	13	24	6
NW	10	16	16	5	2	0
NNW	7	6	4	1	1	0

TOTAL NUMBER OF OBSERVATIONS = 2138
TOTAL NUMBER OF CALMS = 24

QTR= OND

RELATIVE FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
			SPEED(KTS)			
N	.001822	.000906	.000000	.000000	.000000	.000000
NNE	.004548	.000453	.000000	.000000	.000000	.000000
NE	.002743	.004076	.000000	.000000	.000000	.000000
ENE	.007316	.010870	.000453	.000000	.000000	.000000
E	.007333	.015399	.000906	.000000	.000000	.000000
ESE	.002747	.004982	.000906	.000000	.000000	.000000
SE	.003189	.001812	.000906	.000000	.000000	.000000
SSE	.001369	.001359	.000453	.000000	.000000	.000000
S	.001373	.002264	.000000	.000000	.000000	.000000
SSW	.003641	.000906	.000453	.000000	.000000	.000000
SW	.003656	.004982	.000000	.000000	.000000	.000000
WSW	.004569	.005888	.000453	.000000	.000000	.000000
W	.003203	.005435	.000000	.000000	.000000	.000000
WNW	.002731	.000906	.000906	.000000	.000000	.000000
NW	.002738	.002717	.000000	.000000	.000000	.000000
NNW	.002275	.000453	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF A STABILITY= .124094

RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH A STABILITY = .000453

QTR= OND

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	4	2	0	0	0	0
NNE	10	1	0	0	0	0
NE	6	9	0	0	0	0
ENE	16	24	1	0	0	0
E	16	34	2	0	0	0
ESE	6	11	2	0	0	0
SE	7	4	2	0	0	0
SSE	3	3	1	0	0	0
S	3	5	0	0	0	0
SSW	8	2	1	0	0	0
SW	8	11	0	0	0	0
WSW	10	13	1	0	0	0
W	7	12	0	0	0	0
WNW	6	2	2	0	0	0
NW	6	6	0	0	0	0
NNW	5	1	0	0	0	0

NUMBER OF OCCURRENCES OF A STABILITY = 273
NUMBER OF CALMS WITH A STABILITY = 1

QTR= OND

RELATIVE FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000000	.000453	.000000	.000000	.000000	.000000
ENE	.003170	.010870	.000453	.000000	.000000	.000000
E	.001812	.019475	.000906	.000000	.000000	.000000
ESE	.000000	.000906	.000453	.000000	.000000	.000000
SE	.000000	.000906	.000906	.000000	.000000	.000000
SSE	.000000	.000000	.000453	.000000	.000000	.000000
S	.000000	.000000	.001359	.000000	.000000	.000000
SSW	.000453	.000906	.000000	.000000	.000000	.000000
SW	.000906	.000906	.002717	.000453	.000000	.000000
WSW	.000000	.002717	.001359	.000000	.000000	.000000
W	.000000	.002264	.001812	.000000	.000000	.000000
WNW	.000906	.000906	.001359	.000000	.000000	.000000
NW	.000000	.000000	.000000	.000000	.000000	.000000
NNW	.000000	.000453	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF B STABILITY= .060236
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH B STABILITY = .000000

QTR= OND

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	1	0	0	0	0
ENE	7	24	1	0	0	0
E	4	43	2	0	0	0
ESE	0	2	1	0	0	0
SE	0	2	2	0	0	0
SSE	0	0	1	0	0	0
S	0	0	3	0	0	0
SSW	1	2	0	0	0	0
SW	2	2	6	1	0	0
WSW	0	6	3	0	0	0
W	0	5	4	0	0	0
WNW	2	2	3	0	0	0
NW	0	0	0	0	0	0
NNW	0	1	0	0	0	0

NUMBER OF OCCURRENCES OF B STABILITY = 133
NUMBER OF CALMS WITH B STABILITY = 0

QTR= OND RELATIVE FREQUENCY DISTRIBUTION STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000016	.000906	.000000	.000000	.000000	.000000
NNE	.000938	.000906	.000000	.000000	.000000	.000000
NE	.000485	.001359	.000000	.000000	.000000	.000000
ENE	.006414	.024004	.000906	.000000	.000000	.000000
E	.004365	.038496	.002264	.000000	.000000	.000000
ESE	.000509	.002717	.000906	.000453	.000000	.000000
SE	.000469	.000453	.000453	.000000	.000000	.000000
SSE	.000477	.000906	.000000	.000000	.000000	.000000
S	.000008	.000453	.000000	.000000	.000000	.000000
SSW	.002765	.000000	.000906	.000000	.000000	.000000
SW	.001446	.003623	.001359	.000453	.000453	.000000
WSW	.001923	.004529	.001812	.000453	.000000	.000453
W	.000509	.002717	.001359	.000906	.000000	.000000
WNW	.000938	.000906	.000000	.000000	.000000	.000000
NW	.000930	.000453	.000000	.000000	.000000	.000000
NNW	.000000	.000000	.000000	.000000	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF C STABILITY= .117754
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH C STABILITY = .001812

QTR= OND

FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	1 - 3	4 - 6	7 - 10	11-16	17-21	GREATER THAN 21
	SPEED(KTS)					
N	0	2	0	0	0	0
NNE	2	2	0	0	0	0
NE	1	3	0	0	0	0
ENE	13	53	2	0	0	0
E	8	85	5	0	0	0
ESE	1	6	2	1	0	0
SE	1	1	1	0	0	0
SSE	1	2	0	0	0	0
S	0	1	0	0	0	0
SSW	6	0	2	0	0	0
SW	3	8	3	1	1	0
WSW	4	10	4	1	0	1
W	1	6	3	2	0	0
WNW	2	2	0	0	0	0
NW	2	1	0	0	0	0
NNW	0	0	0	0	0	0

NUMBER OF OCCURRENCES OF C STABILITY = 256
NUMBER OF CALMS WITH C STABILITY = 4

QTR= OND

RELATIVE FREQUENCY DISTRIBUTION

STATION = QUEMADO, NEW MEXICO

DIRECTION	SPEED(KTS) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	GREATER THAN 21
N	.000000	.000000	.000000	.000000	.000000	.000000
NNE	.000000	.000000	.000000	.000000	.000000	.000000
NE	.000058	.002264	.000906	.000000	.000000	.000000
ENE	.006662	.042120	.009058	.000000	.000000	.000000
E	.002773	.053442	.007246	.000000	.000000	.000000
ESE	.000234	.009058	.001812	.000000	.000000	.000000
SE	.000023	.000906	.000453	.000000	.000000	.000000
SSE	.000000	.000000	.000906	.000906	.000000	.000906
S	.000488	.000906	.001812	.004982	.001812	.000906
SSW	.000023	.000906	.002717	.004982	.001812	.000000
SW	.001093	.006341	.007246	.003170	.002264	.000453
WSW	.001245	.012228	.025815	.012681	.003623	.002717
W	.000523	.002264	.009058	.021739	.006793	.002717
WNW	.000000	.000000	.000906	.002264	.000453	.000000
NW	.000012	.000453	.002264	.001359	.000000	.000000
NNW	.000000	.000000	.000000	.000453	.000000	.000000

RELATIVE FREQUENCY OF OCCURRENCE OF D STABILITY= .291214
RELATIVE FREQUENCY OF CALMS DISTRIBUTED ABOVE WITH D STABILITY = .003623
(NEUTRAL / DAY)

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Sept. 5, 1985

Site Number SSI #2 Site Name Hubbell #1 Site Location near Quemado

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 5-22-85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = .9085 b_{hv} = 1.252

Audit Orifice # Unit "P" Date Last Calibrated 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 23.60 in.Hg 599.44 mmHg

Present Ambient Temperature (T_2) = 18.5 °C 291.5 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O	Standard Manometer inches H_2O ΔH_{std}	Standard Flowrate Q_{std}	Rotometer Reading	Standard Rotometer Reading I_{std}	Standard Flow rate Q_{hv}
	ΔH	$\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_o}(\Delta H_{std} - b_o)$	I	$I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	9.1	2.709	1.320	52		1.306

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{599.44}{760}\right)\left(\frac{298}{291.5}\right) = .8063$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8980)$$

PERCENT DIFFERENCE = $\frac{(Q_{hv} - Q_{std})}{Q_{std}}$ X 100 = -1.0 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

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ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Sept. 5, 1985

Site Number E 10694 Site Name Hubbell #2 Site Location Near Quemado

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 5/22/85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = 1.0198 b_{hv} = .0698

Audit Orifice # Unit "P" Date Last Calibrated 1/23/85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 23.51 in.Hg 597.15 mmHg

Present Ambient Temperature (T_2) = 18.0 °C 291.00 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O	Standard Manometer inches H_2O ΔH_{std}	Standard Flowrate Q_{std}	Rotometer Reading	Standard Rotometer Reading I_{std}	Standard Flow rate Q_{hv}
	ΔH	$\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_o}(\Delta H_{std} - b_o)$	I	$I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	3.7	1.725	0.841	30		.864

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{597.15}{760}\right)\left(\frac{298.0}{291.0}\right) = .8046$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8970)$$

PERCENT DIFFERENCE = $\frac{(Q_{hv} - Q_{std})}{Q_{std}}$ X 100 = +2.7 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

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ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Sept. 5, 1985

Site Number ______ Site Name BS #1 Site Location Bread Springs School

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 5-24-85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = .8853 b_{hv} = -.8774

Audit Orifice # Unit "P" Date Last Calibrated 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 23.15 in.Hg 588.01 mmHg

Present Ambient Temperature (T_2) = 28.0 °C 301.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O	Standard Manometer inches H_2O ΔH_{std}	Standard Flowrate Q_{std}	Rotometer Reading	Standard Rotometer Reading I_{std}	Standard Flow rate Q_{hv}
	ΔH	$\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_o}(\Delta H_{std} - b_o)$	I	$I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	6.1	2.162	1.054	44		1.125

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{588.01}{760}\right)\left(\frac{298}{301.0}\right) = .7660$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8752)$$

PERCENT DIFFERENCE = $\frac{(Q_{hv} - Q_{std})}{Q_{std}}$ X 100 = +6.8 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Sept. 5, 1985

Site Number TSP-1 Site Name Ft. Wingate Site Location Forest Service

Hi-vol Serial # ______ Inventory # K49957 Rotometer # 17798

Date Hi-vol Last Calibrated ______ # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = .828 b_{hv} = -9.472

Audit Orifice # Unit "P" Date Last Calibrated 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 23.12 in.Hg 587.25 mmHg

Present Ambient Temperature (T_2) = 27.5 °C 300.5 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	5.3	2.015	0.982	34		1.026

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{587.25}{760}\right)\left(\frac{298}{300.5}\right) = .7663$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8754)$$

PERCENT DIFFERENCE = $\frac{(Q_{hv} - Q_{std})}{Q_{std}}$ X 100 = +4.4 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMEN DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Sept. 5, 1985

Site Number TSP-2 Site Name Ft. Wingate Site Location Forest Service

Hi-vol Serial # ______ Inventory # K49261 Rotometer # 17798

Date Hi-vol Last Calibrated 5-23-85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = .889 b_{hv} = -10.077

Audit Orifice # Unit "P" Date Last Calibrated 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 23.12 in.Hg 587.25 mmHg

Present Ambient Temperature (T_2) = 27.5 °C 300.5 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	7.1	2.333	1.137	35		1.135

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{587.25}{760}\right)\left(\frac{298}{300.5}\right) = .7663$$

$$\sqrt{\frac{P_2}{760}\frac{298}{T2}} = (.8754)$$

PERCENT DIFFERENCE = $\frac{(Q_{hv} - Q_{std})}{Q_{std}}$ X 100 = -0.2 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Sept. 5, 1985

Site Number SSI Site Name Ft. Wingate Site Location Forest Service

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 5-23-85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = .826 b_{hv} = -1.041

Audit Orifice # unit "P" Date Last Calibrated 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 23.12 in.Hg 587.25 mmHg

Present Ambient Temperature (T_2) = 27.5 oC 300.5 oK

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	4.8	1.918	.935	38		.913

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{587.25}{760}\right)\left(\frac{298}{300.5}\right) = .7663$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8754)$$

$$\text{PERCENT DIFFERENCE} = \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100 = -2.4 \%$$

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Dec. 10, 1985

Site Number HV-1 Site Name Hubbell #1 Site Location Near Quemado

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 9-6-85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # Unit P Date Last Calibrated 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 23.32 in.Hg 592.33 mmHg

Present Ambient Temperature (T_2) = -2.0 °C 271.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	5.5	2.17	1.06	41		1.07

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T_2}\right) = \left(\frac{592.33}{760}\right)\left(\frac{298}{271}\right) = .8570$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.9258)$$

$$\text{PERCENT DIFFERENCE} = \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100 = +0.9 \%$$

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Dec. 10, 1985

Site Number HV-2 Site Name Hubbell #1 Site Location near Quemado

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 9-6-85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # Unit P Date Last Calibrated 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 23.32 in.Hg 592.33 mmHg

Present Ambient Temperature (T_2) = -2.0 °C 271.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O	Standard Manometer inches H_2O ΔH_{std}	Standard Flowrate Q_{std}	Rotometer Reading	Standard Rotometer Reading I_{std}	Standard Flow rate Q_{hv}
	ΔH	$\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_o}(\Delta H_{std} - b_o)$	I	$I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	5.5	2.17	1.06	41		1.06

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{592.33}{760}\right)\left(\frac{298.0}{271.0}\right) = .8570$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.9258)$$

PERCENT DIFFERENCE = $\frac{(Q_{hv} - Q_{std})}{Q_{std}}$ X 100 = 0.0 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating 'im Booker Date Dec 10, 1985

Site Number SSI-2 Site Name Hubbell #1 Site Location Near Quemado

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 9-6-85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # Unit P Date Last Calibrated 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 23.32 in.Hg 592.33 mmHg

Present Ambient Temperature (T_2) = -2.0 °C 271.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	6.1	2.29	1.11	46		1.15

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{592.33}{760}\right)\left(\frac{298}{271}\right) = .8570$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = \left(.9258 \right)$$

PERCENT DIFFERENCE = $\frac{(Q_{hv} - Q_{std})}{Q_{std}}$ X 100 = +3.2 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

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ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating: Tim Booker   Date: Dec. 10, 1985

Site Number: Hi-Vol   Site Name: Hubbell #2   Site Location: near Quemado

Hi-vol Serial # ______   Inventory # ______   Rotometer # ______

Date Hi-vol Last Calibrated: 9-6-85   # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice #: Unit P   Date Last Calibrated: 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 23.32 in.Hg   592.33 mmHg

Present Ambient Temperature (T_2) = -2.0 °C   271.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O	Standard Manometer inches H_2O ΔH_{std}	Standard Flowrate Q_{std}	Rotometer Reading	Standard Rotometer Reading I_{std}	Standard Flow rate Q_{hv}
	ΔH	$\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_o}(\Delta H_{std} - b_o)$	I	$I\sqrt{\frac{P_2}{760}\frac{298}{T_2}}$	$\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	4.1	1.87	0.91	32		.92

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{592.33}{760}\right)\left(\frac{298}{271}\right) = .8570$$

$$\sqrt{\frac{P_2}{760}\frac{298}{T2}} = (.9258)$$

$$\text{PERCENT DIFFERENCE} = \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100 = +1.1\ \%$$

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760}\frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760}\frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating: Tim Booke   Date: Dec. 10, 1985

Site Number: BS-1   Site Name: Breed Springs   Site Location: Breed Springs School

Hi-vol Serial #: ______   Inventory #: ______   Rotometer #: ______

Date Hi-vol Last Calibrated: 9-6-85   # of Calibration Kit Used: ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice #: Unit P   Date Last Calibrated: 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 22.93 in.Hg   582.42 mmHg

Present Ambient Temperature (T_2) = 4.0 °C   277.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O	Standard Manometer inches H_2O ΔH_{std}	Standard Flowrate Q_{std}	Rotometer Reading	Standard Rotometer Reading I_{std}	Standard Flow rate Q_{hv}
	ΔH	$\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_o}(\Delta H_{std} - b_o)$	I	$I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	4.7	1.97	0.96	38		1.01

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{582.42}{760}\right)\left(\frac{298}{277}\right) = .8244$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.9080)$$

$$\text{PERCENT DIFFERENCE} = \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100 = +5.2\ \%$$

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Bocka Date Dec. 10, 1985

Site Number TSP-1 Site Name Ft. Wingate Site Location Forest Service

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 9-6-85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # Unit P Date Last Calibrated 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 22.93 in.Hg 582.42 mmHg

Present Ambient Temperature (T_2) = 2.5 oC 275.5 oK

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	4.0	1.82	0.89	28		0.86

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{582.42}{760}\right)\left(\frac{298}{275.5}\right) = .8289$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = \left(.9105\right)$$

$$\text{PERCENT DIFFERENCE} = \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100 = -3.4\ \%$$

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating: Tim Booker Date: Dec. 10, 1985

Site Number: TSP-2 Site Name: Ft. Wingate Site Location: Forest Service

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated: 9-6-85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice #: Unit P Date Last Calibrated: 1-23-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 22.93 in.Hg 582.42 mmHg

Present Ambient Temperature (T_2) = 2.5 °C 275.5 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O	Standard Manometer inches H_2O ΔH_{std}	Standard Flowrate Q_{std}	Rotometer Reading	Standard Rotometer Reading I_{std}	Standard Flow rate Q_{hv}
	ΔH	$\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_o}(\Delta H_{std} - b_o)$	I	$I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	5.2	2.08	1.01	30		1.02

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{582.42}{760}\right)\left(\frac{298}{275.5}\right) = .8289$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.9105)$$

$$\text{PERCENT DIFFERENCE} = \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100 = +1.0 \%$$

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating: Tim Burke Date: Dec 10, 1985

Site Number: SSI Site Name: Ft. Wingate Site Location: Forest Service

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated: 9-6-85 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice #: Unit "P" Date Last Calibrated: 1-22-85

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4864 b_o = -.0046

Present Barometric Pressure (P_2) = 22.93 in.Hg 582.42 mmHg

Present Ambient Temperature (T_2) = 2.5 oC 275.5 oK

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760}\frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	4.5	1.93	0.94	40		0.98

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T_2}\right) = \left(\frac{582.42}{760}\right)\left(\frac{298}{275.5}\right) = .8289$$

$$\sqrt{\frac{P_2}{760}\frac{298}{T2}} = (.9105)$$

$$\text{PERCENT DIFFERENCE} = \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100 = +3.8\ \%$$

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760}\frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Feb. 18, 1986

Site Number HV-I Site Name Hubbell # 1 Site Location Near Quemado

Hi-vol Serial # ________ Inventory # ________ Rotometer # ________

Date Hi-vol Last Calibrated 12-11-86 # of Calibration Kit Used ________

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ________ b_{hv} = ________

Audit Orifice # P Date Last Calibrated 2-17-86

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4877 b_o = -.0305

Present Barometric Pressure (P_2) = 23.46 in.Hg 595.88 mmHg

Present Ambient Temperature (T_2) = 18.0 °C 291.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O	Standard Manometer inches H_2O ΔH_{std}	Standard Flowrate Q_{std}	Rotometer Reading	Standard Rotometer Reading I_{std}	Standard Flow rate Q_{hv}
	ΔH	$\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_o}(\Delta H_{std} - b_o)$	I	$I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	6.9	2.354	1.163	45		1.256

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T_2}\right) = \left(\frac{595.88}{760}\right)\left(\frac{298}{291.0}\right) = .8029$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T_2}} = (.8961)$$

PERCENT DIFFERENCE = $\frac{(Q_{hv} - Q_{std})}{Q_{std}}$ X 100 = +8.0 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Feb 18, 1986

Site Number HV-II Site Name Hubbell #1 Site Location Near Quemado

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 12-11-86 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # P Date Last Calibrated 2-17-86

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4877 b_o = -.0305

Present Barometric Pressure (P_2) = 23.46 in.Hg 595.88 mmHg

Present Ambient Temperature (T_2) = 18.0 °C 291.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	6.1	2.213	1.094	42.5		1.157

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{595.88}{760}\right)\left(\frac{298}{291.0}\right) = .8029$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8961)$$

$$\text{PERCENT DIFFERENCE} = \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100 = +5.8 \%$$

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Feb. 18, 1986

Site Number SSI - II Site Name Hubbell #1 Site Location Near Quemado

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 12-11-86 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # P Date Last Calibrated 2-17-86

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4877 b_o = -.0305

Present Barometric Pressure (P_2) = 23.46 in.Hg 595.88 mmHg

Present Ambient Temperature (T_2) = 18.0 °C 291.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	8.8	2.658	1.311	52		1.363

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{595.88}{760}\right)\left(\frac{298}{291.0}\right) = .8029$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8961)$$

$$\text{PERCENT DIFFERENCE} = \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100 = +3.9\ \%$$

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Feb. 18, 1986

Site Number TSP Site Name Hubbell #2 Site Location Near Quemado

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 12-11-86 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # P Date Last Calibrated 2-17-86

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4877 b_o = -.0305

Present Barometric Pressure (P_2) = 23.46 in.Hg 595.88 mmHg

Present Ambient Temperature (T_2) = 18.0 °C 291.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O	Standard Manometer inches H_2O ΔH_{std}	Standard Flowrate Q_{std}	Rotometer Reading	Standard Rotometer Reading I_{std}	Standard Flow rate Q_{hv}
	ΔH	$\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_o}(\Delta H_{std} - b_o)$	I	$I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	$\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	5.8	2.158	1.067	38		.996

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{595.88}{760}\right)\left(\frac{298}{291.0}\right) = .8029$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8961)$$

PERCENT DIFFERENCE $= \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100$ = -6.7 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booker Date Feb. 18, 1986

Site Number TSP Site Name Bread Springs Site Location Bread Springs

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 12-11-86 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # P Date Last Calibrated 2-17-86

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4877 b_o = -.0305

Present Barometric Pressure (P_2) = 23.1 in.Hg 586.74 mmHg

Present Ambient Temperature (T_2) = 16.0 °C 289.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	7.3	2.411	1.191	46		1.27

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{586.74}{760}\right)\left(\frac{298}{289.0}\right) = .7961$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8922)$$

PERCENT DIFFERENCE = $\frac{(Q_{hv} - Q_{std})}{Q_{std}}$ X 100 = +6.6 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Booke Date Feb. 18, 1986

Site Number TSP-1 Site Name Ft. Wingate Site Location Forest Service

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 12-11-86 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # P Date Last Calibrated 2-17-86

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4877 b_o = -.0305

Present Barometric Pressure (P_2) = 23.13 in.Hg 587.5 mmHg

Present Ambient Temperature (T_2) = 16.0 °C 289.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \cdot \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	4.8	1.956	.969	32		1.01

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{587.5}{760}\right)\left(\frac{298}{289}\right) = .7971$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (\ .8928\ )$$

PERCENT DIFFERENCE $= \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100$ = +4.2 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Burke Date Feb. 18, 1986

Site Number TSP-2 Site Name Ft. Wingate Site Location Forest Service

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 12-11-86 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # P Date Last Calibrated 2-17-86

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4877 b_o = -.0305

Present Barometric Pressure (P_2) = 23.13 in.Hg 587.50 mmHg

Present Ambient Temperature (T_2) = 16.0 °C 289.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	6.7	2.311	1.142	32		1.237

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{587.5}{760}\right)\left(\frac{298}{289}\right) = .7971$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8928)$$

$$\text{PERCENT DIFFERENCE} = \frac{(Q_{hv} - Q_{std})}{Q_{std}} \times 100 = +8.3\ \%$$

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$

AIR QUALITY BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION

HIGH VOLUME SAMPLER AUDIT FORM

Person Calibrating Tim Burke Date Feb 18, 1986

Site Number SST Site Name Ft. Wingate Site Location Forest Service

Hi-vol Serial # ______ Inventory # ______ Rotometer # ______

Date Hi-vol Last Calibrated 12-11-86 # of Calibration Kit Used ______

HIGH-VOL CALIBRATION DATA: $\frac{1}{m_{hv}}$ = ______ b_{hv} = ______

Audit Orifice # P Date Last Calibrated 2-17-86

ORFICE CALIBRATION DATA: $\frac{1}{m_o}$ = .4874 b_o = -.0305

Present Barometric Pressure (P_2) = 23.13 in.Hg 587.5 mmHg

Present Ambient Temperature (T_2) = 16.0 °C 289.0 °K

ORIFICE INFORMATION				HIGH-VOL INFORMATION		
Plate	Manometer inches H_2O ΔH	Standard Manometer inches H_2O ΔH_{std} $\sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$	Standard Flowrate Q_{std} $\frac{1}{m_o}(\Delta H_{std} - b_o)$	Rotometer Reading I	Standard Rotometer Reading I_{std} $I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$	Standard Flow rate Q_{hv} $\frac{1}{m_{hv}}(I_{std} - b_{hv})$
13	4.2	1.830	.907	36		.957

DO NOT ADJUST ROTOMETER DURING AUDIT CHECK !!

$$\left(\frac{P_2}{760}\right)\left(\frac{298}{T2}\right) = \left(\frac{587.5}{760}\right)\left(\frac{298}{289.0}\right) = .7971$$

$$\sqrt{\frac{P_2}{760} \frac{298}{T2}} = (.8928)$$

PERCENT DIFFERENCE = $\frac{(Q_{hv} - Q_{std})}{Q_{std}}$ X 100 = +5.5 %

USEFUL FORMULAS:

$$\Delta H_{std} = \sqrt{\Delta H \frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{std} = \frac{1}{m_o}(\Delta H_{std} - b_o)$$

$$I_{std} = I\sqrt{\frac{P_2}{760} \frac{298}{T_2}}$$

$$Q_{hv} = \frac{1}{m_{hv}}(I_{std} - b_{hv})$$